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AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

VOLUME XII DECEMBER 17, 1923 NUMBER 28

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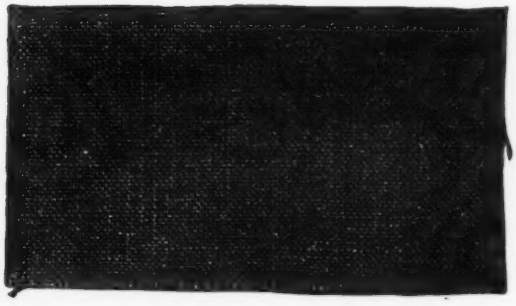

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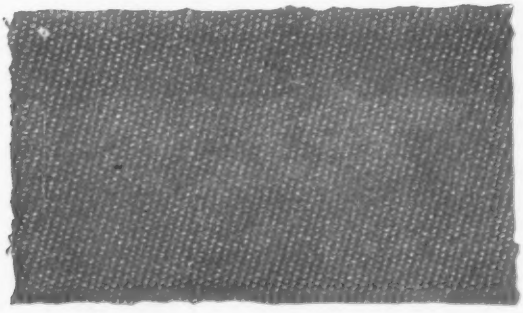

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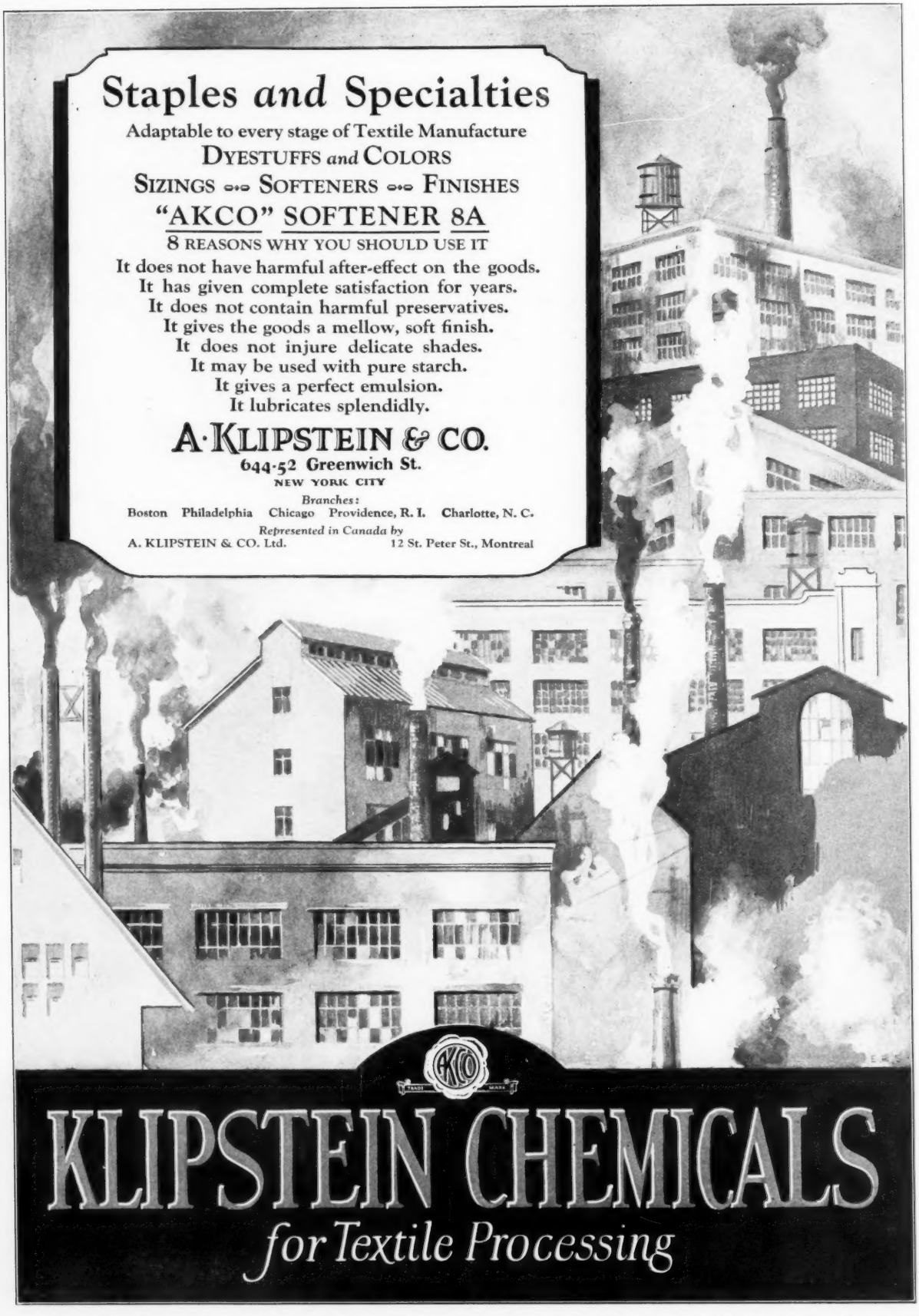
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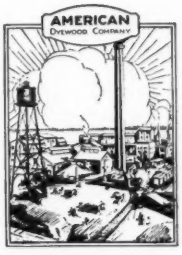

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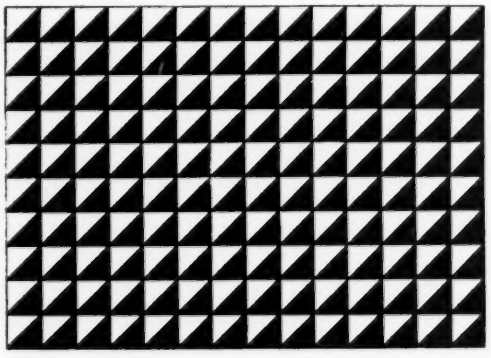

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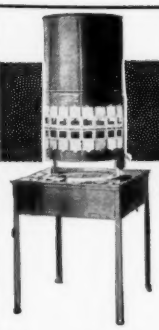

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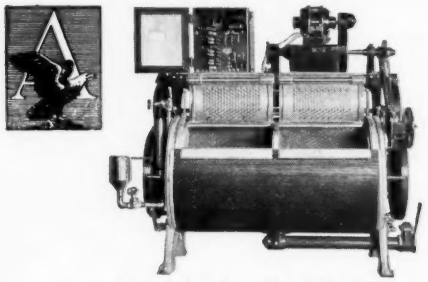

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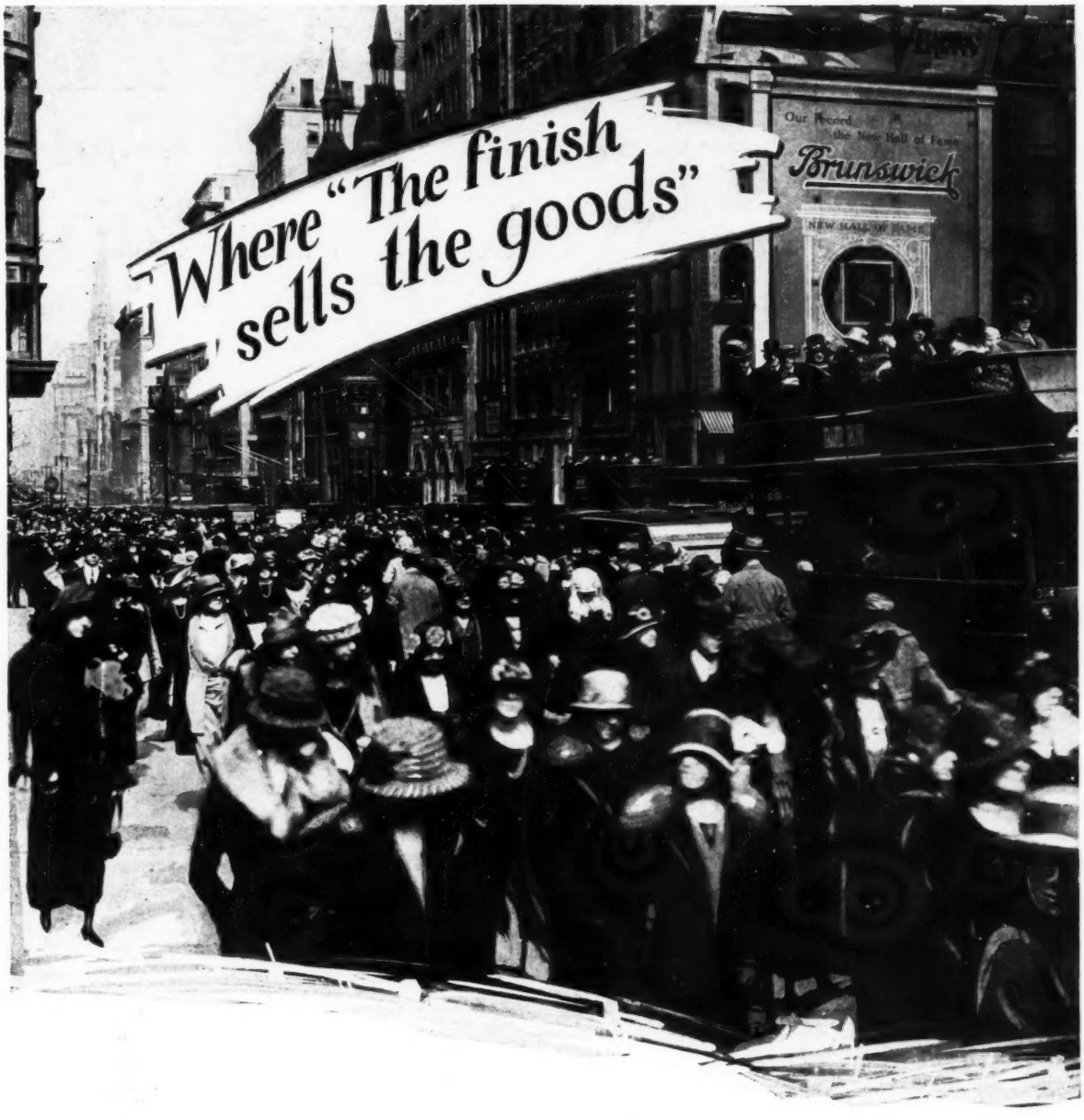

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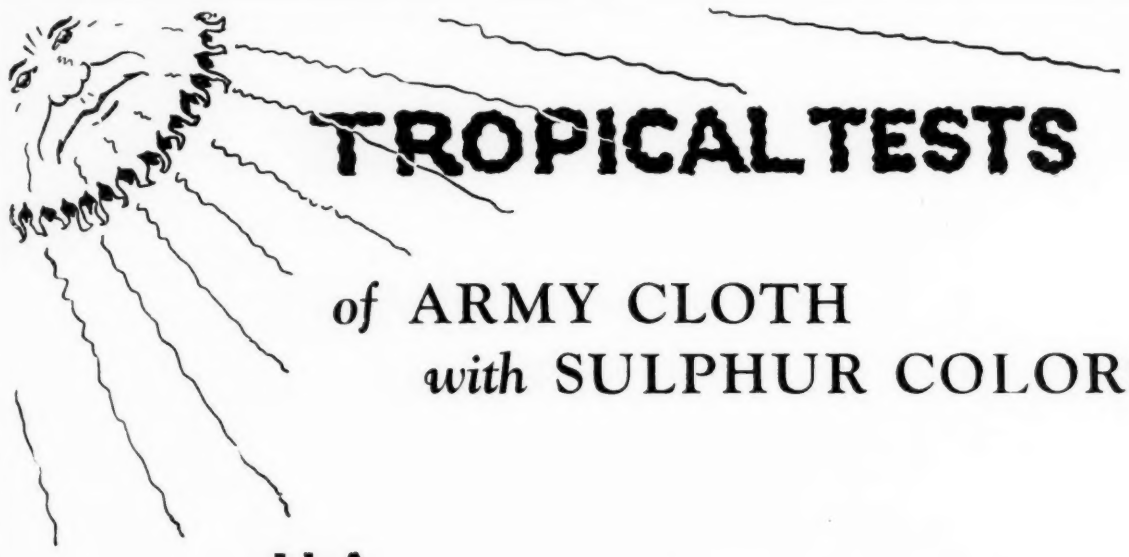

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VOLUME XII | NEW YORK, DECEMBER 17, 1923 | NUMBER 26

Methods for Testing Dyes Used in Tinting and Coloring Paper

Solubility—Strength of Soluble Dyes—Comparing Dyes and Pigments by the Sheet Method—Fastness to Alkali—Fastness to Light—Acid, Basic and Substantive Dyes

By G. K. SPENCE

THE following points should be considered when examining a dye for use in the paper industry: solubility, strength, shade, fastness to light, fastness to alkali, and whether it is an acid, basic or substantive dye. It is necessary that the color man in the mill be in possession of this information, in order that he will know how to handle the dye and be familiar with its adaptability to the manufacture of paper of various requirements.

Solubility

It is customary for the color man to make up standard strength solutions of soluble dyes—that is, a certain number of pounds per barrel of water—in order that he can, by measuring out a certain number of liquid ounces—determine the amount of color added to the stock. It is, therefore, advisable to take a solution of the dye under examination corresponding to the strength used in the mill, and if such a solution can be made the sample is marked O. K. in this respect. If it is impossible to make a solution of corresponding strength, a larger proportion of water can be used and the point determined at which the dye is completely soluble. This information should accompany the report made in the sample under examination, so that the color man can change his solution accordingly, and if the dye is not completely soluble in water at a convenient strength for handling in the mill he will know that it is necessary to thoroughly agitate the solution each time before measuring the required quantity for use in the beater of stock. This point should also be considered when making the standard solutions for comparison in the laboratory.

Comparing Strength of Soluble Dyes

Standard solutions of all dyes to be examined are first made by dissolving 0.2 gram in 200 c.c. of water in a graduated flask, heating if necessary to complete solution.

If the dyes are soluble and of about the same shade they are first compared in manganese comparison tubes in the following manner: Take 5 c.c. of each standard solution and dilute with water in the comparison tubes until the depth of color exactly matches, making the dilution such that any slight difference can be readily detected. If there is not a color comparator at hand very good results can be obtained by wetting a piece of filter paper, pasting it on a window away from sunlight and comparing the colors by placing the comparison tubes against this and by alternating the position of the tubes. The point at which there is the same apparent difference when either tube is in the same position in respect to the other can be considered the point at which they are matched. From the reading on the tubes the comparative difference in strength of the dyes can be calculated.

For example, if when matched the reading on the tube containing sample "A" is 95 c.c. and the reading on the tube containing sample "B" is 122 c.c., sample "B" is 28.4 per cent stronger than sample "A," and therefore worth 28.4 per cent more money if all other properties are equal.

This method of comparison can only be applied to soluble dyes, and not to pigments. It is not always reliable, but furnishes an idea as to the amount of dye to use when comparing same by the sheet method.

Comparing Soluble Dyes and Pigments by the Sheet Method

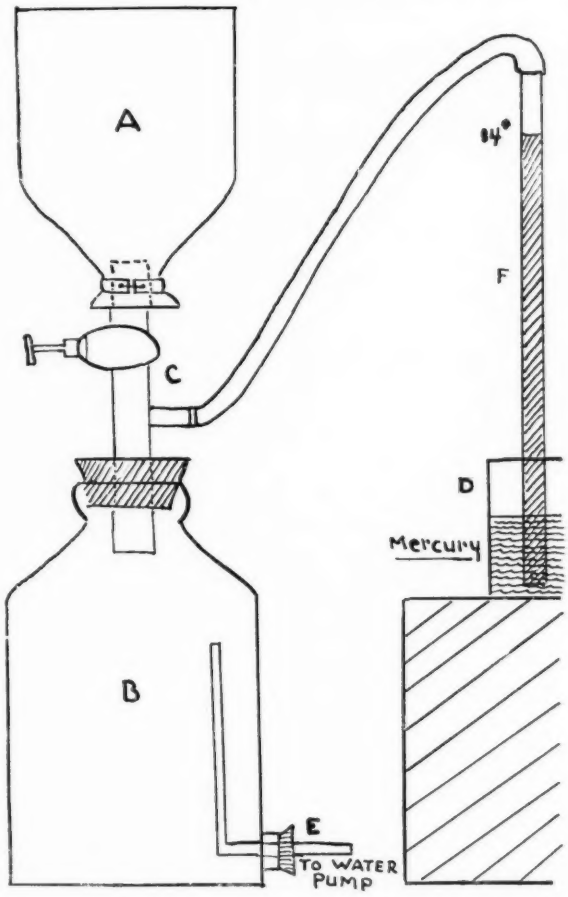
In perfecting this method it has been the intention of the writer to represent mill conditions as nearly as possible, regarding consistency at which the color, size and alum are added, dilution at which the sheet is formed (this dilution being made with water representing return water), and the manner in which the sheets are pressed and dried.

Standard sheets are made with the use of all dyes under examination. These standard sheets are made by dyeing bleached sulphite pulp at the rate of 1, 2 and 5 pounds of dye per 1,000 pounds of pulp and sized with 1.2 per cent rosin and 1.6 per cent alum. In order to make uniform standard sheets and avoid the necessity of making a moisture determination on the sulphite each time color samples are compared, it is advisable to have a quantity of sulphite pulp of known moisture content on hand, which is prepared as follows: Take several pounds of bleached sulphite pulp from a lap, tear in small pieces, mix thoroughly and take small quantities from different parts of the pile for a sample in which to determine the moisture content. Fill a number of 2-quart Mason jars by taking portions from different parts of the pile in the same manner in which the sample was taken for moisture determination. From the moisture determination the value of the sulphite pulp in terms of bone-dry fiber is known when making standard sheets. The jars of stock are kept in a cool place and can be used for the above purpose without molding for three or four months.

The size solution used contains 24 grams of rosin per liter, and the alum solution 12.7 grams of aluminum sulphate per liter.

When making standard sheets, the equivalent of 12 grams of bone-dry sulphite is taken. If the stock sulphite contains 67 per cent moisture, 36.36 grams should be weighed out each time. It is advisable to duplicate mill conditions as nearly as possible when making up these sheets. The color and sizing agents are added when the stock is at a 5 per cent consistency. Before taking out the sample used in making the sheet, a constant amount of water should be added to represent the amount added at the beaters when washing to the machine chest, reducing it to a 3.3 per cent consistency, and the sample taken out for formation of the sheet should be diluted with colored water, representing return water, to 0.66 per cent consistency before forming the sheet, which is representative of the consistency of the stock flowing on the wire. It is necessary to color 12 grams of stock in order to get enough colored water (representing return water) to make final dilution before forming the sheet. When the stock is at a 3.3 per cent consistency, one-sixth of the stock is taken out and preserved for final dilution for formation of the sheet, which will contain 2 grams of bone-dry fiber. The remainder of the stock is squeezed in a hand sheet mold and the colored water used as above mentioned for proper dilution to form the sheet.

There are different miniature hand sheet-making devices on the market, but the writer has fitted up an inexpensive apparatus for forming sheets which produces excellent results. The following rough sketch



will give an idea as to its construction. "A" is a plumber's ordinary 6-inch rubber force cup used for forcing waste pipes. This is clamped to a quarter-inch iron pipe "C" fitted with a valve and tee. The other end of the pipe is passed through a rubber stopper in a 4-liter aspirator bottle "B." A glass tube is passed through a rubber stopper in the bottom opening of the aspirator bottle and turned up. This glass tube is connected by means of a rubber tube with a water pump attached to the sink faucet. The tee branch of the pipe "C" is connected by means of a rubber tube with a glass tube "F" extending into a mercury reservoir "D." The sheets after formation are all subjected to the suction of a 14-inch vacuum, which is regulated by closing the valve on the pipe "C," turning on the faucet and allowing it to run until the mercury reaches the 14-inch mark on the glass tube.

The standard sheets are made up as follows (assuming the stock sulphite to contain 67 per cent moisture and 33 per cent bone-dry fiber):

Place 36.36 grams of sulphite (equivalent to 12 grams of bone-dry fiber) in each of three 500-c.c. glass containers, which containers can be made by breaking off heavy glass quart bottles at the point where they will hold about 500 c.c. Label the containers No. 1, No. 2, No. 3; to each add 203.64 c.c. of water and mix thoroughly with a policeman. To each add 6.3 c.c. of size solution, mix thoroughly, add 15 c.c. of alum solution and mix thoroughly. To No. 1 add 12 c.c., to No. 2, 24 c.c., and to No. 3, 60 c.c. of the standard dye solution; mix thoroughly and allow to stand twenty minutes. Add to No. 1, 90.7 c.c. of water; to No. 2, 78.7 c.c. of water, and to No. 3, 42.7 c.c. of water; mix thoroughly, take out a 60.7 measure level full of the stock (this measure can be made by breaking off a 100 c.c. green glass bottle at the proper height) and pour it into a 500 c.c. glass container. Press the balance of the stock in a small hand mold and add 241 c.c. of the colored water from this stock to the stock in the 500-c.c. container.

The stock is now ready to form the sheet. Mix thoroughly and pour at once on a 6-inch-diameter 80-mesh sieve. When the water has drained from the sieve and the sheet is formed, place the sieve over "A" of the sheet-making apparatus and subject to a 14-inch vacuum by rapidly opening the valve on the pipe "C" after the mercury has reached the 14-inch mark on the glass tube "F." Remove the sieve, place a felt disk made from paper machine woolen felt over the sheet, and press with a block of wood, which fits inside of the sieve and is provided with a handle for the purpose, on a block of wood which fits under the bottom of the sieve. After pressing, the felt having the sheet of paper adhering to it is removed, placed sheet down on a piece of cheap filter paper (this is bought a ream at a time in large sheets and cut into smaller sheets for this purpose), pressed with the block, the felt removed, another piece of filter paper placed over the sheet, pressed again and dried in a drying oven at 200 deg. Fahr.

The above procedure is carried out with each of the three samples, the sheets of paper produced representing the use of 1 pound, 2 pounds and 5 pounds of dye per 1,000 pounds of stock.

Two sheets 1¾ by 3½ inches are cut from each disk and the two sets of standard sheets are bound together. One set is filed away for laboratory reference and the other is attached to the report made on the sample under examination. If standard sheets made from all dyes are kept in a dark place they can be used to match other sheets made in the same manner. By comparing standard sheets one can form some idea as to the amount of dye to add in order to procure a perfect match, and thus determine the money value of the sample under examination. There are times when the dyes are not of the same shade and cannot be matched exactly without the use of other colors, in which case consideration must be given the values of the other colors in order to determine the value of the dye under examination, whether these values be additive or subtractive.

For example: If Blue B is used for dyeing a paper stock and it is necessary to use some red in the beater in order to produce the required shade, consideration should be given the red when comparing a new blue with the sample of Blue B in use. This can be better explained by giving an actual comparison as follows:

1 pound Blue B (at $4) + 0.005 lb. Rhodamine Bx (at $5) = 1.2 pounds of new blue.

The new blue is, therefore, worth $3.38 per pound. On the other hand, if Blue R is used in an order requiring fully as much red and following results were obtained when comparing:

1 pound Blue R (at $4.50) = 1.5 pounds new blue + 0.05 pound Rhodamine Bx (at $5).

the new blue is worth $2.83 per pound.

When pigments such as ochre and ultramarine are compared with soluble dyes or with each other, standard sheets are made in the usual manner, with the exception that the proportion of pigment is weighed and added to the stock in dry form, but the proportion of dye in the standard sheets is higher. For example: Standard sheets made by using ochre are made up at the rate of 20 pounds, 60 pounds and 100 pounds per 1,000 pounds of stock.

A very good, rapid method of comparing pigments is by mixing like proportions with varying amounts of zinc oxide in linseed oil until same depth of color is reached when compared on small glass slides, and the difference in strength is dependent upon the difference in quantity of zinc oxide colored.

For example: If 1 gram of ochre under examination colors 10.2 grams of zinc oxide to the same depth of color as 1 gram of ochre used in the mill colors 10 grams of zinc oxide, the new sample is 2 per cent stronger than the one in use and therefore worth 2 per cent more, provided all other properties are equal.

It is, however, advisable to prove this by the sheet method, which more nearly represents mill conditions.

Fastness to Alkali

This test is made by subjecting the dyed sheets made by the sheet method to the action of a 1 per cent caustic soda solution. One drop of the caustic solution is placed on each of the sheets under examination, allowed to remain for a couple of seconds, after which the sheets are raised and the drop allowed to run off. The sheets are then hung up until the treated portion

is perfectly dry. Dyes like Chrysophenin and Indanthrene are very resistant to this action, while dyes like Auramine, Blue R and Blue B are acted upon very readily by this solution.

Fastness to Light

This test is made by placing the sample sheets in cardboard folders so that half of the sheet is exposed and the other half under the cardboard. In this way they are exposed to sunlight for ten hours, care being taken that both samples being compared are subjected to the same sunlight during the entire time of exposure. The difference in results due to exposure can be readily seen when the samples are removed from the cardboard folders.

Acid, Basic, and Substantive Dyes

These tests are made in the usual manner. A solution of the dye is treated with alum and boiled in a test tube, and if after standing for some time a precipitate appears it is considered an acid dye. If no precipitate appears another portion of the solution is boiled, after addition of a solution of tannic acid, in which case the presence of a precipitate will indicate that it is a basic dye. If no precipitate appears by either treatment the dye is considered a substantive dye. On account of the affinity of strongly basic dyes for the fiber it is advisable that the color man be familiar with the action of the dyes on hand, so that they can be handled in such a manner as to avoid mottling the sheet of paper.

The Sizing of Linen Fabrics and Transparent Batiste

Parchmentization of the Fibers—Buckram or Hat Linen—Sizing of Buckram and Padding Materials—Sizing Collar Buckram

By A. MARSHALL

Textil-Berichte 1923, 32-33, 179-180

(Translated by Ismar Ginsberg, B.Sc., Chem. Eng.)

TRANSPARENT batiste is a textile fabric in which a good deal of interest has been manifested within recent times. Its finishing consists in simple parchmentization of a cotton muslin which is peculiarly suited for this purpose, and which comes on the market in the finest sort of yarns made from the best grade of Egyptian cotton.

Before the cloth is parchmentized or made transparent, the muslin must be bleached, or at any rate the fabric must be boiled very thoroughly a number of times so that all impurities that may be mixed with the fiber and that are peculiar to its natural state are completely removed. This is an important step in the process, for the manufacture of a perfectly clear, glass-like finish on the fabric is dependent to a large degree on the thoroughness with which it is treated in the preliminary washing process. An additional preliminary condition is the mercerization of the fiber, which is best carried out in special mercerizing machines which are available on the market. After the usual washing which the mercerized goods receive after their chemical treatment, the former are washed again in acidified water and then dried in drying lofts, where the goods are subjected to tension while they are drying. In this manner a textile is obtained in which the individual threads are as straight as possible. It is also advisable to conduct the drying process which precedes the mercerization treatment in a similar manner.

Parchmentization of the Fibers

The parchmentizing process is effected with the aid of sulphuric acid of 53 to 54 deg. Be. gravity. The apparatus in which this process is carried out consists of a trough lined with lead in which there are placed a cooling coil, also made of lead, and a stationary guide roller made of glass. Round glass rods are ararranged at both the long sides of the trough where the goods enter and leave the apparatus. An adjustable arrangement carries the glass guide roller so that it may be used at the point where the goods enter the apparatus or else merely to guide the material through the sulphuric acid bath.

There is also provided a washing and spraying device which consists of several troughs, arranged one after the other in series and provided with guide rollers and squeeze rolls.

The dry mercerized fabric is led through the bath of sulphuric acid. The latter is maintained at a temperature which varies as little as possible from 12 to 14 deg. Cent. This is accomplished by circulating

cold water through the lead coil at the bottom of the trough. The rapidity of the passage of the fabric through the sulphuric acid bath is adjusted in such a manner that at the very maximum from six to eight seconds are consumed in the passage of the goods through the bath from the time when it first dips into the acid to that when it leaves the acid. The variation from six to eight seconds yields goods of different grades. In other words, it is a simple matter to regulate the time that the goods remain in contact with the acid in order to obtain products with different degrees of transparency.

The impregnated material then immediately passes between glass rollers, which wipe off the acid that accumulates on both the top and bottom surfaces of the cloth, and finally the latter passes between rubber squeeze rolls. The next step is the washing and spraying of the material. In this connection it must be mentioned that the first wash bath must be acidified with 2-deg. Be. sulphuric acid. Then the cloth is washed very thoroughly with water to which soda has been added, which removes all traces of acid. The fabric is now given a second mercerization treatment, which is followed by bleaching or dyeing in the usual manner employed with mercerized goods. The goods are then dried in a moderately warm drying loft, where they are subjected to tension while getting rid of the moisture content.

Buckram or Hat Linen

Buckram, which is also known under the name of hat linen, as it is employed to a large degree in making ladies' hats, is a light cotton weave made from Louisiana cotton, which is very strongly and stiffly sized. In sizing or finishing buckram the apparatus used consists of an ordinary double-roll starching machine, tension frames about 20 meters long, and provided with needle fasteners and drying chambers of about the same length. The crude cloth is first well starched on the starching machine and simultaneously colored with the following color batch:

Four kilograms of potato flour.
Four kilograms of talc.
Three hundred grams of Cotton Black E Extra (Badische).
Two hundred grams of Dianil Black (Hoechst).

The sized material is then stretched on the tension frames and coated with a thick starch composition which has the following constitution:

To every hundred liters of water there are added:
Eight kilograms of potato flour.
Five kilograms of dextrin.
Three hundred grams of Cotton Black E Extra (Badische).
Two hundred kilograms of Dianil Black N (Hoechst).
Thirty grams of Oxamine Pure Blue 6B (Badische).

This starch paint, as it may be called, which must be well cooked before it can be used, is spread over the surface of the cloth by means of large hand brushes. The painted surface is then gone over carefully with a scraping tin about 15 cm. deep and 50 cm. long. This tool is also used to remove any of the starch paint which penetrates through the fabric and streaks the under side of the same. The tension frames are then placed in the drying lofts. The drying takes place at a high temperature. A great deal of care must be taken in sizing the cloth in this way, and only the most skilled and conscientious laborers can be employed. At the present time all of this work is carried out by hand. There appears to be an opportunity here for an important improvement in the technology of the process if some up-to-date, progressive textile machinery house would undertake to develop a machine which would permit this sizing operation to be carried out mechanically instead of by hand. There does not seem to be any insurmountable obstacle in the way of a successful completion of such an undertaking.

Sizing of Buckram and Padding Materials

Buckram and padding linen are much used in the making of clothing. There are four different kinds of buckram, as follows:

1. Pure linen; woven from all linen fiber.
2. Half linen; woven from linen and cotton fibers.
3. Half linen; woven from linen and jute fibers.
4. Pure jute weave.

The finishing or sizing of these materials is a comparatively simple process. Besides possessing considerable stiffness, these materials, after being sized, must have a springy resistance and they must not be brittle. Specially constructed machines are used in the sizing or finishing process. These machines are essentially calenders combined with drying cylinders. The materials are first passed through the machines for a preliminary treatment before the sizing preparation is applied.

In order to obtain an elesatic material by sizing the pure linen padding the following composition is employed:

Seven kilograms of bone glue.
Four kilograms of dextrin.
Half a kilogram of wax.
Third of a kilogram of parafin.

These substances are mixed with 100 liters of water and allowed to cook for ten minutes in order to obtain a well-dissolved and homogeneous solution. The material is starched or sized on one side; then, after drying, it is well cooled, shrunk and calendered.

In the sizing of buckram, where a heavier sizing preparation must be employed, especially when the buckram consists of half cotton and half linen fiber, the following sizing composition is recommended:

Twelve kilograms of bone meal.
Twelve kilograms of dextrin.
Fifty grams of caustic soda (previously dissolved).

These substances are dissolved in 100 kilograms of water and allowed to digest for ten minutes in an autoclave under 2.5 atmospheres pressure. The fabric is sized on both side either once or twice, according to the kind of finished product desired. This is carried on on a combined sizing and cylinder drying machine. After the fabric has been cooled, it is shrunk and calendered.

When a particularly stiffly sized material is desired, the fabric is treated with the following composition:

Ten kilograms of bone meal.
Ten kilograms of dextrin.
Eight kilograms of glue.

These ingredients are similarly dissolved in 100 liters of water and thoroughly cooked for ten minutes. The fabric is then given a triple treatment with this sizing composition on the sizing machine.

Sizing Lapel and Collar Buckram

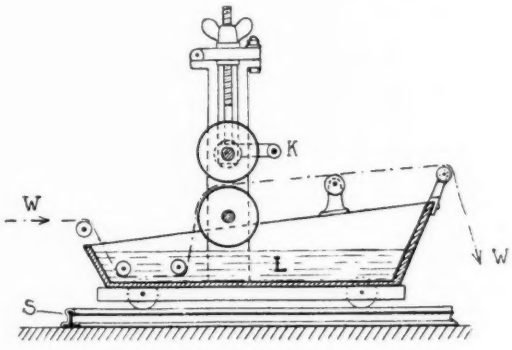
One grade of buckram which is employed especially for stiffening collars and lapels of coats is subjected to a special sizing process. A good grade of this material is generally sized on both sides so that approximately 3 kilograms of bone glue are used for every 10 square meters of cloth.

The raw fabric, just as it comes from the loom, is dried three times, passed through the hydraulic iron mangle and then sized on both sides, while being stretched between tension frames, with the following sizing preparation:

Four kilograms of glue.
Seven kilograms of yellow dextrin.
Four-tenths kilogram of paraffin.
Seven-tenths kilogram of japan wax.

These constituents are dissolved in 100 liters of water and cooked without pressure for ten minutes. The goods are then sized three times on each side while the goods are still on the tension frames. The first and second sizings are best carried out with a preparation made by dissolving 22 kilograms of the best grade of glue and 1 liter of glycerine in 100 liters of water (rather hot). The third sizing can be carried out with a solution containing 20 kilograms of glue in 100 liters of water, without the addition of glycerine.

Between the first two sizings the fabric is allowed



Impregnating Machine
W, Goods; S, Rails on which Apparatus runs; K, Crank; L, Solution of Glue

to dry thoroughly. Finally it is rolled up and allowed to remain in a cool room, preferably a dry cellar, for three to four days. The glycerine which is contained in the fibers of the cloth absorbs moisture from the air and gives the fabric a softer feel. After this treatment the goods are calendered once again in the cold.

The illustration shows an apparatus which is useful in impregnating the materials after they have been given a preliminary treatment with glue solutions. The machine moves backward on rails which are arranged above the racks on which the goods are hung.

ITALIAN FIRM SEEKS AMERICAN CONNECTIONS

One of our subscribers, Emanuele Turin, 5 Via Parini, Torino, 13, Italy, requests that we announce to our readers the fact that this firm is engaged in the general business of handling colors and other chemical products. They will be glad to consider acting as Italian sales agents for American concerns manufacturing products of this character.

The Clifton Piece Dye Works, Inc., have been organized with a capital of $100,000, to operate a plant at Clifton, N. J. The office is at 54 Mill Street, Paterson. The registered agent is Albert E. Emerson, one of the incorporators of the company.

Indigo and Its Application

Part IV

Indigo Extract, Indigo Carmine, Indigotine—Tests for Indigo on the Dyed Fiber—Indigo Analysis —Reference Books

By PHILIP S. CLARKSON

H. A. Metz & Co., New York

Indigo Extract, Indigo Carmine and Indigotine

BY treatment of indigo with sulphuric acid under proper conditions the disulphonic acid is formed. This is largely used in dyeing under the above names. The products differ widely, being modified by the conditions of manufacture and the strength and purity of the material used.

The methods of dyeing and resulting colors are very different from the vat blue. This form of the indigo coloring matter is used only for wool dyeing, and is dyed in a bath containing sulphuric acid and Glauber Salt, and may be combined with all acid dyeing colors. The shades so produced are not fast to either light or fulling, but the use of these products is large, on account of their level dyeing quality.

Indigo Extract.—Under the name of Saxony Blue or chemic, the impure disulphonic acid has been used in the dyehouse for a long while. This was prepared by dissolving powdered indigo in strong sulphuric acid and allowing the mixture to stand for some time. On account of the quality of acid present, it is not necessary to add any to the dye bath. This may be prepared from Indigo powder by dissolving one part of Indigo powder in eight of sulphuric acid 168 deg. Tw. at temperature of 120 deg. Fahr.

The commercial Indigo Extract is made in the same way, but the excess of acid is removed.

Indigo Carmine.—This consists of the indigo disulphonic acid neutralized with soda and comes on the market in the form of a thick paste which is used in the same manner as the extract.

Indigotine.—Indigotine is made from Indigo Carmine by drying and pulverizing, and is practically the pure sodium salt of indigo disulphonic acid.

Before the introduction of synthetic Indigo, it was necessary in the manufacture of Indigo Carmine and Indigotine to purify these, on account of the substances present in natural Indigo which made the shade duller, but by the use of synthetic Indigo in the manufacture of these products, Indigo Extract, Indigo Carmine and Indigotine all yield shades of the same purity, the difference being only in the strength of the dyestuff.

Tests for Indigo on the Dyed Fiber

One of the most conclusive evidences of the indentity of the synthetic and natural Indigo is the fact that it is impossible to detect any difference between them when applying the distinctive tests to the dyed material. The following are the methods of identification of Indigo in common use:

1. *Application of Strong Nitric Acid.*—This should give a bright yellow spot with a green ring. This is the so-called "Indigo test." It is the one usually used by the purchaser, but is without practical value, as many of the artificial dyestuffs give almost the same reaction. It was only valuable when the dyewoods were extensively used for making blues.

2. When carefully ignited, indigo dyed goods (particularly cotton) give off purple vapors which may be condensed on cold porcelain to blue deposits.

3. Strong sulphuric will turn the color yellow, then olive, changing to green and then blue. On the addition of water the blue color remains and wool may be dyed blue in the solution. This is due to the formation of indigo sulphonic acid.

4. Hydrochloric acid has no effect.

5. Boiling alcohol extracts only a small amount of color.

6. Alkalies have little or no effect, although in the case of cotton some color may be extracted.

7. In the case of shades made with Indigo in combination with other dyestuffs, the Indigo may be extracted with sodium hydrosulphite, the solution oxidized and special tests applied to the blue coloring matter which will result if any Indigo is present.

These are the usual tests for identity, but the several governments have special tests for fastness specified for their uniform cloths. Usually those consist in subjecting the cloth to the action of dilute acids and alkalies. No change of shade must result.

Indigo Analysis

Although since in commercial introduction of synthetic Indigo, the need of analyzing Indigo samples has decreased, the following methods are given, as occasion may arise for the comparison of natural and synthetic samples or the strength of the latter may be in dispute.

Permanganate Method

One gram of the well-dried Indigo sample is weighed into a short tube; then 7 c.c. sulphuric acid 168 deg. Tw. are added and the whole heated for half an hour

in a water bath of about 195 deg. Fahr. The solution is poured into 100 c.c. cold water and then filtered into a 1 liter bottle. After washing the filter with hot water until the latter is perfectly colorless the solution and washwater are filled up to exactly 1 liter.

Twenty c.c. of this solution are diluted with 300 c.c. distilled water in a white porcelain dish of 500 c.c. capacity and titrated with a permanganate solution containing 0.5 gr. $K_2M_2O_8$ per liter. The permanganate solution is added in drops while constantly stirring the Indigo solution. The titration is finished when the blue has changed to gold yellow without green reflection.

For comparison a very pure indigo of known percentage is always titrated at the same time. This enables one to find the percentage of the latter by a simple equation:

A—Indigo of known percentage requires 17.2 c.c. permanganate.

B—Indigo of unknown percentage requires 16.2 c.c. permanganate.

A—Contains 99 per cent Indigo.

B—Contains therefore B 99—16.6:17.2.

B —95.5 per cent.

The result of the titration is generally controlled by a dye test. The same solutions that served for the titration are used for dyeing. The Indigo of known percentage (the "type") is dyed in three different strengths, viz., 10 gr. of wool yarn or cloth are dyed with 100, 98 and 96 c.c.

The number of c.c. of the Indigo solution of unknown strength is found by multiplying by 100 the quotient of the tritration.

$$\frac{100 \cdot 17.2}{16.6} = 100.1.036 = 103.6 \text{ c.c.}$$

Since the dye baths must not contain more than 4 per cent free sulphuric acid, the superfluous acid of the Indigo solutions must be neutralized with 0.1 c.c. soda solution (1.10) for every 1 c.c. Indigo solution. The varying additions of soda naturally produce varying amounts of Glauber salt in the dye baths. This difference is equalized by adding 2.7 c.c. Glauber salt solution (1.10) for every deficient c.c. of soda, viz.: The bath containing the highest percentage of soda will require no addition of Glauber salt at all.

A. Type of Indigo (known percentage) sol. 1:1000.
B. Sample of Indigo (unknown percentage) sol. 1:1000.

1. For 100 c.c. of A are required 10 c.c. soda solution and 0.6 Glauber salt solution.
2. For 98 c.c. of A are required 9.8 c.c. soda solution and 1.3 Glauber salt solution.
3. For 96 c.c. of A are required 9.6 c.c. soda solution and 1.9 Glauber salt solution.
4. For 103.6 c.c. of B are required 10.3 c.c. soda solution and no Glauber salt solution.

For a second dyeing test the baths are prepared as stated above, but 50 c.c. of Flavazine S are added to each bath. Thus green shades are produced, which are easier compared as regards depth and purity of shade than blues.

The dye tests are to be carried out simultaneously under exactly equal conditions as to temperature, time, etc. The result will corroborate or correct the figures arrived at by titration.

Hydrosulphite Method

The method which is most recommended for accuracy and rapidity is based on the reduction of indigo sulphonic acid by sodium hydrosulphite.[1]

Preparation of Sodium Hydrosulphite.—100 c.c. of sodium bisulphite ($NaHSO_3$) solution (sp. gr. 1.30) are mixed with 10 grms. of zinc powder in a flask closed by a cork. The flask is immersed in cold water and allowed to stand for about half an hour, when the solution will be found to have lost the smell of sulphurous acid. The liquid is now decanted, and well mixed in a large flask or bottle, with five liters of distilled water, containing in suspension about 50 grms. of recently slacked lime. The vessel is closed to prevent access of air, and, after allowing the insoluble matters to subside, the clear liquid is siphoned off into a convenient store bottle and about 100 c.c. of petroleum oil is poured on the surface of the liquid to prevent oxidation. The bottle is provided with a cork through which pass two tubes, one of which is in the form of a siphon, and is used to fill the burette; the other tube, which only just passes through the cork, is connected with a supply of hydrogen or coal gas.

Standardizing the Hydrosulphite.—The solution may be standardized either by pure indigotin or by an ammoniacal solution of sulphate of copper, using in the latter case a solution of Indigo Carmine as an indicator. Fernthsen[2] pointed out in 1881 that ammoniacal sulphate of copper alone could not be used for estimating the strength of a solution of sodium hydrosulphite, as the solution of sulphate of copper became colorless before it was completely reduced. On this account he proposed that, towards the end of the titration, a few drops of indigo-sulphate solution should be added, by which modification the termination of the reaction could be easily and accurately ascertained. Muller found in his experiments that one molecule of ammoniacal sulphate of copper was decolorized by the same quantity of hydrosulphite as one molecule of Indigotin dissolved in sulphuric acid. The standard solution of copper sulphate is prepared by dissolving 1.904 grm. (equal to 1 grm. indigotin) of the crystallized salt ($CuSO_45H_2O$) in a liter of water containing 100 c.c. of strong ammonia (sp. gr. .880); 50 c.c. of this solution are measured into a wide-mouthed flask (capacity 200 c.c.), boiled to expel air

[1] A. Muller, Ber. XIII, 2283, American Chemist V, 128, also Dic. R. G. L. 189.

[2] Chemical News XLIII, 79.

and allowed to cool. The flask is provided with a caoutchouc stopper, perforated with four holes, into two of which are fitted two Mohr's burettes, one containing the hydrosulphite solution and the other the indigo-carmine. The two other apertures serve for the entrance and exit of a current of hydrogen or coal gas. It is essential that the process should be conducted without access of air. The burette containing the hydrosulphite is furnished with a perforated cork, through which passes a glass tube connected with a supply of coal gas; and at the lower extremity a glass tube is joined to it, which is in connection with the bottle filled with sodium hydrosulphite above mentioned. By this means the burette can be refilled without fear of oxidizing the hydrosulphite solution. The flask containing the 50 c.c. of copper sulphate is attached to the caoutchouc stopper, and the air is expelled by a current of coal gas, which should first pass through U tubes containing ferrous hydrate. The solution of "hydrosulphite" is now gradually run in until the liquid becomes nearly colorless, when a few drops of Indigo Carmine are added from the other burette, and finally a further quantity of hydrosulphite is added, until the solution assumes a peculiar brownish-red color. The end of the reaction is sharp and unmistakable. The quantity of hydrosulphite which is used to decolorize the few drops of Indigo Carmine solution is very small, but by determining the relative strength of the two liquids the amount thus consumed can be easily calculated and then deducted from the number of c.c. used in the titration of the copper sulphate solution. The 50 c.c. of copper sulphate are equivalent to .05 Indigotin, so that supposing 25 c.c. of sodium hydrosulphite have been required for the titration, each c.c. of the hydrosulphite will correspond to .002 Indigotin. Whenever an analysis of Indigo is to be made the hydrosulphite solution requires restandardizing.

Titration of Indigo-Sulphate.—The operation is performed in a similar manner to that just described. 0.5 grm. of finely-powdered Indigo is mixed with ground glass and dissolved in sulphuric acid, as previously stated in detail. The sulphindigotic acid is diluted to 500 c.c. and filtered; 50 c.c. of the filtrate are measured into a flask, boiled to expel air and allowed to cool. The flask is then attached to the burettes, and after driving out the air by a current of coal gas the hydrosulphite solution is gradually added during constant agitation. With Indigotin and the better qualities of Indigo the liquid when fully reduced becomes of a pale yellow tint, but with inferior samples the solution is more or less of a dirty brownish-yellow color. In both cases, however, the end of the reaction is quite clear and distinct.

The hydrosulphite method gives the percentage of Indigotin and does not include Indigo Red.

Example: 50 c.c. standard ammoniacal sulphate of copper (.05 Indigotin) required 30 c.c. sodium hydrosulphate; therefore

$$1 \text{ c.c. hydrosulphite} = \frac{.05}{30} = .00166 \text{ Indigotin.}$$

One gram of Java Indigo was dissolved in sulphuric acid and diluted with water to 1 liter; 50 c.c. (= .05 indigo) required 20.6 c.c. hydrosulphite; therefore

$$\frac{.00166 \times 20.0 \times 100}{.05} = 68.4 \text{ per cent Indigotin.}$$

Gravimetric Methods

Another method of estimating the real Indigotin present in commercial Indigo is based on its reduction to the leuco derivative (white Indigo) and reoxidation of this by exposure to air. Some of the processes for effecting this are tedious and deficient in accuracy, but the following, in one of which the reduction is effected by a ferrous hydroxide, and in the other by a hydrosulphite, are recommended by C. Rawson. The iron process is conducted by treating 1 gram of the finely powdered sample in a flask with 2 grams of crystallized ferrous sulphate, 5 of caustic soda and 1,000 c.c. of water. The flask is closed by a cork having three perforations, through one of which passes a syphon, while the other two are used for the entrance and exit of a current of the coal gas. The contents of the flask are maintained at a temperature a little below the boiling point for 1½ to 2 hours, when the source of heat is removed and the insoluble matters allowed to subside. A measure of 500 c.c. (= ½ gram of the sample) is now siphoned off, and the reduced Indigo oxidized by passing a current of air through the solution. To complete the precipitation the liquid is acidified, and the precipitate of Indigotin, mixed with Indirubin and Indigo Brown, allowed to subside. The supernatant liquid is passed through a weighed filter and the precipitation washed several times by decantation with hot water. It is then boiled with alcohol, which dissolves the brown and red coloring matters, allowed to cool to insure the separation of any traces of dissolved Indigotin, transferred to the filter, washed with rectified spirit and the pure Indigotin dried at 100 deg. and weighed.

The following method is preferred by C. Rawson as leaving nothing to be desired in point of accuracy and being more rapid than any other reduction process: 1 gram of the finely powdered sample is made into a paste with water and treated in a flask with about 600 c.c. of lime water. The flask is closed by a cork having four perforations, two of which serve for the passage of a current of coal gas, a third carries a siphon, while to the fourth is fitted a tap funnel. The contents of the flask are heated to 80 degrees and 100 to 150 c.c. of a strong solution of sodium hydrosulphite introduced through the tap funnel. In a few minutes the liquid assumes a yellow tint and is maintained at a temperature near the boiling point for half an hour. After allowing the insoluble matter to subside an aliquot part of the solution should be removed and a current of air drawn through it for about twenty minutes, when it is acidified with hydrochloric acid. The precipitate, consisting of

a mixture of Indigotin and Indirubin, is collected on a weighted filter, thoroughly washed with hot water, dried at 100 degrees and weighed. It is then exhausted by boiling alcohol, whereby the Indirubin is dissolved, and can be estimated from the loss of weight or recovered by evaporating the alcohol solution.[3]

In a method described by H. M. Rau (Jour. Amer. Chem. Soc., 1885, 7, 16), which is a modification of one previously suggested by Fritsche (*Annal, Chem. xliv.* 290), the Indigo is reduced in alkaline solution by glucose. The operation is conducted in a weighed flask of about eight ounces' capacity, fitted with a cork carrying two tubes. From 1½ to 2 grams of the sample of indigo, 3 to 4 of pure grape sugar, from 5 to 10 c.c. of a 40 per cent solution of caustic soda, 60 c.c. of water and about 120 c.c. of rectified spirit are employed, and the total weight of the apparatus is observed.

The flask is heated in a water bath for half an hour and allowed to rest for another hour. One of the two tubes is then connected with an apparatus generating carbon dioxide, by which the liquid expelled is noted, and the Indigotin is then precipitated by passing a current of carbon dioxide for about fifteen minutes, and this is followed by a current of air to complete the precipitation. The precipitate is crystalline, and is readily washed. It is stated by Rau to represent the Indigotin and Indirubin of the sample, but Rawson has pointed out (*Jour. Soc. Dyers, etc.*, 1., 211) that the solubility of Indirubin in alcohol renders its precipitation improbable, and he has proved by actual experiment that the precipitate obtained by Rau's process consists of pure Indigotin, yielding nothing either to cold alcohol or to ether.[4]

[3] Allen Com. Org. An., Vol. 3, I., pages 396, 397.

[4] Allen, Com. Org. An., Vol. 3, I., page 397.

Reference Books

If the reader is interested in the chemical investigation and manufacture of indigo the following authorities will be found useful and interesting:

A Dictionary of Dyes, Mordants and Other Compounds Used in Dyeing and Calico Printing, by Rawson, Gardner & Laycock. (Dic. R. G. L.)

Watt's Dictionary of Chemistry, by Morley & Muir. (Watt's Dic.)

Dyeing of Textile Fabrics, J. J. Hummel. (Hummel.)

Allen's Commercial Organic Analysis, Volume 3, Part I., Second Edition. (Allen, Com. Org. An., 3-I.)

Chemie der Organischen Farbstoffe, Nietzki.

A Manual of Dyeing, by Knecht, Rawson & Loewenthal. Second Edition. (Man., K., R. & L.)

Chemie des Matieres Colorantes Artificielles, Seyewetz & Sisley.

Traite des Materieres Colorantes, Lefevre.

(The abbrevations in parentheses are those used in the footnotes.)

Ammonia and Ammonium Salts in Bleaching and Dyeing

Ammonia Gas—Dyeing Effects and Alkalinity—The Metachrome Process—Alginic Acid—Kier Boiling—Estimation of Nitrogen

By A. J. HALL

PRACTICALLY all the ammonia used by bleachers and dyers is obtained as a by-product in the manufacture of coal gas or from coke ovens. Coal usually contains 1 to 2 per cent of nitrogen, and during its conversion into coke and gas this nitrogen is converted partly into cyanides and partly into ammonia. Hence the resulting gas requires to be passed through water scrubbers as a process of purification, and it is from the ammoniacal and tar liquors thus produced that ammonia is ultimately recovered.

In the usual practice the ammoniacal liquor, which contains many substances other than ammonia, is allowed to stand until the tar separates, and it is then distilled after the addition of a considerable quantity of lime. Any ammonium salt yields gaseous ammonia when heated with a caustic alkali such as lime, sodium and potassium hydroxides. Hence by employing suitable condensers attached to the distilling plant the ammonia can be distilled from the ammoniacal liquor and ultimately obtained dissolved in water (the solutions thus obtained are usually of 0.920 or 0.880 specific gravity) or united with an acid in the form of a pure ammonium salt, e. g., ammonium sulphate.

Ammonia is very easily soluble in water—one volume of water will dissolve 1,100 volumes of the gas—considerable heat being evolved at the same time. This solubility, curiously enough, hindered early investigators in their endeavors to isolate ammonia, and it was not until Priestley, some two hundred years ago, substituted mercury for water, that ammonia was isolated and shown to be a gas.

Solutions containing ammonia gradually lose strength when exposed to the air, so that for most works' purposes it is preferable to buy 0.920 ammonia instead of the stronger 0.880 ammonia. This commercial product should be water-white and have the correct specific gravity. Naturally the higher the specific gravity the weaker is the strength of the solution; 0.880 ammonia solution contains 36 per cent of ammonia gas by weight, while 0.920 ammonia contains but 22 per cent. The most convenient method of checking works' consignments of

ammonia is by means of the modified specific gravity bottle shown in Fig. 1.

This apparatus is similar in most respects to the ordinary pattern, since it comprises a bottle A in the neck of which fits a well-ground-in perforated stopper B. It, however, has a cover C (perforated at D) which fits (ground surface) over the outside of the neck of the bottle A. This type of specific gravity bottle has the

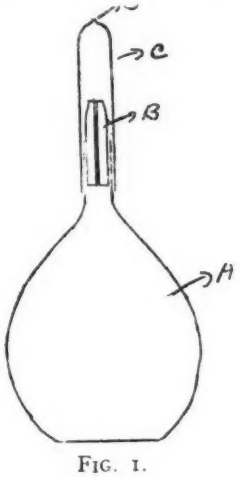


FIG. 1.

advantage that it does not allow of the rapid escape of the vapors of any volatile liquors which it may contain.

In determining the specific gravity of a sample of ammonia, it is merely necessary to weigh the apparatus when dry and empty (say m grams), when filled with water (n grams), and when filled with the sample (k grams). Then

$$\text{Specific Gravity (of sample)} = \frac{k-m}{n-m}$$

Since, however, the density of a solution of ammonia varies with temperature, the specific gravity of any sample must be determined at 15 to 16 deg. Cent.

In textile work, ammonia finds its chief use as a mild alkali. Thus in the scouring of wool, where caustic soda or potash would be dangerous and sodium carbonate slightly harmful, ammonia may be used without fear of injuring the wool. In the cleansing of wool, ammonium carbonate, though somewhat expensive, is an excellent detergent. Furthermore, ammonia is a volatile alkali and may therefore be dried up in fabrics without deleterious effect.

Advantage of this mild alkaline property may be utilized in the dyeing of wool with indigo—ammonia may be used to maintain the alkalinity of the dye liquor. Also, in the dyeing of cotton-wool and cotton-silk union fabrics with sulphur dyestuffs, it is advantageous to use ammonium sulphate in the sodium sulphide dye liquor.

DYEING EFFECTS AND ALKALINITY

When attention is paid to the alkalinity of a sulphur dye liquor, some interesting points are revealed concerning the relation between dyeing effects and the alkalinity. For instance, when cotton-wool is dyed from a cold (30 deg. Cent.) dye liquor containing 6 per cent each of sulphur black dye and ammonium sulphide ($[NH4]_2S$), the cotton may be dyed a heavy shade of black and the wool remain practically unstained. Under similar conditions, using sodium sulphide instead of ammonium sulphide, the shade on the cotton will be found to be considerably less deep, while the wool is stained. It is known that when a solution of ammonium sulphate is added to one containing sodium sulphide, double decomposition occurs, and the following reaction partially takes place:

$$(NH_4)_2SO_4 + Na_2S = (NH_4)_2S + Na_2SO_4.$$

Ammonium sulphide is thus formed to a considerable extent. Hence the addition of ammonium sulphate to a sulphur dye liquor (containing sodium sulphide) will largely convert it to a liquor similar to one prepared with ammonium sulphide. Consequently it will be found that if dyeing is carried out under the conditions described above, using a liquor containing sodium sulphide and ammonium sulphate, the cotton is dyed to a good shade of black and the wool is but slightly stained.

The use of ammonium sulphate for sulphur dyeing under these conditions has been patented by Lodge and Evans, and the results obtained are satisfactory. However, these results are not so good as those obtained by means of a dye liquor prepared directly with ammonium sulphide, and it is to be regretted that the high price of this substance and its somewhat unpleasant odor are serious factors which appear likely to prevent ammonium sulphide being used in sulphur dyeing.

Ammonium sulphate also finds application in a recently patented process for producing transparent effects on cotton fabrics. As is generally known, when cotton fabric is immersed in concentrated sulphuric acid it is rapidly attacked and ultimately dissolves. If, however, the action is retarded by the use of ice cold acid and the exposure of the fabric to the acid is limited to but a few seconds, the fabric may be subsequently washed in water, and it will then be found to be partially transparent but having an undesirable stiffness. The effect of the acid, however, is considerably modified if it contains a dissolved ammonium salt such as ammonium sulphate. In that case the fabric after the treatment has a soft velvet handle and yet has a transparent appearance. The patent states that the acid treatment is suitably carried out with an acid solution consisting of 69.82 per cent of sulphuric acid, 5 to 12 per cent of ammonium sulphate, and 26 to 6 per cent of water. The immersion of the fabric may extend for 5 to 10 seconds provided that the temperature of the acid mixture is not greater than 18 deg. Cent., and that the washing with water follows immediately.

The exact action of the ammonium salt in this process is not known, but its effect is probably connected with the fact that cotton is a colloid and that the surface layer has a strong affinity for electrolytes.

The Metachrome Process

Ammonium salts also play an important part in the metachrome process for dyeing wool.

When a solution of sodium bichromate is added to a solution containing an acid mordant dyestuff for wool, precipitation of the dyestuff usually occurs. This is due to the formation of an insoluble chrominum lake, and it is also for this reason that acid colors dyed on wool are usually improved in fastness by an after-chrome treatment.

In certain instances, however, it is found that this precipitation does not occur when yellow sodium chromate is substituted for the corresponding red bichromate, provided that no acid is present. On addition of acid, however, the chromate is thereby changed to a bichromate thus:

$$2\ Na_2CrO_4 + H_2SO_4 = Na_2Cr_2O_7 + Na_2So_4 + H_2O$$

sodium chromate sodium bichromate

and the precipitation of the dyestuff occurs.

This behavior is utilized in the metachrome process of dyeing wool. The dye bath is charged with a solution containing the dyestuff, yellow sodium chromate (often prepared by adding sodium carbonate or ammonia to the solution of the bichromate) and ammonium sulphate. On raising the temperature of the dye liquor, the ammonium sulphate is gradually decomposed, partly by loss of ammonia through volatilization and partly by oxidation. The solution thus becomes gradually acidic, so that the chromate is converted into bichromate and the chrominum lake of the dyestuff becomes continuously fixed on the wool.

Alginic Acid

Although not widely known among finishers, ammonium alginate and ammonium solutions of various, but particularly the aluminium salt, metallic salts of alginic acid are useful substances for use in the finishing of cotton fabrics.

Alginic acid is obtained from seaweed directly, and at one time was obtained as a by-product in the manufacture of iodine from seaweed by the *wet* process. Considerable quantities of seaweed are collected on the rugged shores of Scotland and Brittany, and when boiled with a solution of sodium carbonate these weeds yield an aqueous extract containing sodium alginate. The extract is very viscous and it is filtered only with considerable difficulty. However, after filtration it is treated with hydrochloric acid, and gelatinous alginic acid is precipitated and can be filtered off and dried.

Alginic acid is a nitrogenous compound and somewhat complex, having the formula $C_{76}H_{80}O_{22}N_2$. Is is insoluble in water, but readily dissolves in alkalis and forms insoluble salts with aluminium and copper. These metallic salts, however, are soluble in ammonia, and by means of these solutions it is obvious that cotton or other fabrics may be mordanted—it merely being necessary to pad the fabric with the solution and then dry it, whereby the ammonia is driven off and the insoluble metallic salt remains.

On the other hand, since alginic acid may be dried so as to form thin transparent films, it will obviously be useful in finishing. For this purpose the alginic acid should be dissolved in ammonia, and this solution used for filling fabric. When the fabric is subsequently dried, the ammonia is driven off and an insoluble transparent film of alginic acid remains.

Solutions of alginic acid are very viscous, and a 2 per cent suspension of alginic acid in water is almost jellylike. Hence alginic acid and the alginates may also be used as thickening agents.

In the Kier-Boiling

Ammonium salts must also play an interesting part in the kier-boiling of cotton goods. It is well known that gray cotton fabrics contain about 0.6 per cent of nitrogenous bodies and that these are removed during kiering and bleaching. Incidentally, it may here be noted that wool contains about 17 per cent of combined nitrogen.

In the kier the nitrogenous matters are decomposed by the caustic alkalis present. Probably free ammonia is at first formed, and that this is subsequently oxidized to nitrates or nitrites. No one appears to have thoroughly investigated this part of the kier process, but the results would probably justify the labor involved in doing so.

In the bleaching of cotton fabrics for white it is very essential that they should, when finished, contain no nitrogenous matters. For fabrics which have to be subsequently dyed this requirement is not so necessary. But it must be remembered that many types of bacteria require nitrogenous food and cannot exist without it. Hence a perfectly pure white fabric will be less likely to develop stains such as are due to bacterial growths than one which is imperfectly bleached and contains nitrogenous matter. The following method, suitable for determining the nitrogen in cotton or other fabrics, will therefore be found useful.

Estimation of Nitrogen

In the first place, if the nitrogen present in a fabric were entirely in the form of an ammonium salt, a suitable method of estimation would consist of boiling the fabric with caustic soda and collecting the ammonia evolved. This ammonia could then be titrated with an acid and its amount so determined. For when an ammonium salt is heated with an alkali the ammonia is completely displaced. For instance, in the case of ammonium sulphate, treatment with caustic soda will produce a reaction as indicated by the following equation:

$$(NH_4)_2\,SO_4 + 2NaOH \longrightarrow 2NH_3 + Na_2SO_4 + 2H_2O$$

Other complex nitrogenous compounds are not so easily

(*Continued on page* 920)

Proceedings of the American Association of Textile Chemists and Colorists

The American Association of Textile Chemists and Colorists

President
Louis A. Olney
Lowell Textile School, Lowell, Mass.

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Rhode Island Section—
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Leslie L. Bamberger, Secretary, U. S. Finishing Company, Providence, R. I.

New York Section—
Elvin H. Killheffer, Chairman, Newport Chemical Works, Passaic, N. J.
Herbert Grandage, Secretary, 121 Willard Avenue, Bloomfield, N. J.

Philadelphia Section—
Robert E. Rose, Chairman, E. I. du Pont de Nemours & Co., Wilmington, Del
Elmert C. Bertolet, Secretary, Philadelphia Textile School, Philadelphia, Pa

ANNUAL MEETING

THE third annual meeting of the American Association of Textile Chemists and Colorists was held at the Providence-Biltmore Hotel, Providence, R. I., Friday and Saturday, December 7th and 8th. The first session Friday evening was in the nature of an informal gathering without a set program, during which members renewed acquaintances and discussed subjects of mutual interest.

At the morning session Saturday, the following papers were read and discussed:

The Possibility of Setting Standards of Allowable Variations in Shade in Commercial Delivery of Textiles, Miles R. Moffatt.

Some Problems Encountered in Inspecting Dyed Yarns in the Dyehouse, Walter F. Haskell.

Dyeing of Olive Drab, by Allen A. Claflin.

Bleaching, Dyeing and Finishing of Cellulose Acetate Silk, Royal Little.

There was also a somewhat lengthy discussion of the work being carried on by the research committee of the Association, with particular reference to the future research policy of the Association.

At the afternoon session reports of officers were received and Amendments to the Constitution were adopted. Tellers then reported upon the ballot for the election of officers for the coming year, which had been carried on by mail. The result of the ballot showed that all retiring officers had been re-elected.

The technical program for the afternoon included the reading and discussion of the following papers:

The Use of Monel Metal in the Bleachery and Dyehouse, by R. J. McKay.

Vat Dyes: Their Properties and Various Phases of Their Application, by G. K. Hannah, Jr.

Analysis of Sizing Materials, by J. J. Sokolinski.

Dyeing of Sulphur Colors on Silk, by Dr. R. E. Rose.

Factors Which Affect the Stability of Hydrosulphite Discharge Pastes, with Suggestions for Improvement, by Dr. Charles S. Hollander.

Several other papers were scheduled for presentation, but lack of time made it impossible.

Saturday evening was devoted to the annual banquet in the ballroom of the hotel at which 230 members and guests were in attendance. Percival J. Wood presided as toastmaster. The speakers were Louis A. Olney, President of the Association; Hon. Joseph H. Gainer, Mayor of Providence, and Robert H. Newcomb, Executive's Assistant, Boston & Maine Railroad.

Detailed, verbatim reports of all sessions of the annual meeting will be published in the Proceedings, beginning with the issue of December 31st.

EIGHTEENTH COUNCIL MEETING

The Eighteenth Council Meeting of the American Association of Textile Chemists and Colorists was held on Friday, November 2, 1923, at the City Club, Boston, Mass.

The following members were in attendance: L. A. Olney, William H. Cady, W. C. Durfee, William D.

Livermore, George A. Moran, W. K. Robbins, R. F. Culver, H. Christison and W. E. Hadley.

The following applicants were admitted to membership:

Active Membership

Branscomb-Doyle, J. F., 311 East 201st Street, New York City. Superintendent dyeing and finishing, Whitestone Dye Works.

Brigg, Louis, c/o R. Busse, 275 Cortlandt Street, Belleville, N. J. Dyer, Belleville Dye Works.

Chase, W. W., Box 57, North Dighton, Mass. Chemist, Mount Hope Finishing Company.

Corkum, H. D., 49 Sagamore Street, Manchester, N. H. Chemical department, Amoskeag Manufacturing Company.

Gibson, Trevor H., 841 Eastern Parkway, Brooklyn, N. Y. Colorist, Geigy Company, New York City.

Jones, Roy L., 805 Webster Place, Plainfield, N. J. Demonstrating salesman, Calco Company.

Lind, Ed. D., 1953 Sixty-second Street, Brooklyn, N. Y. Textile chemist, Ciba Company.

Moss, Dyer S., Newport Chemical Works, Inc., Passaic, N. J. Demonstrator.

Nadler, August, 292 St. John's Place, Brooklyn, N. Y. Dyer, R. H. Comey & Co.

Oates, John F., Fort Mill, S. C. Dyer, Fort Mill Manufacturing Company.

Smith, Thomas, Jr., 278 Laurel Street, Manchester, N. H. Dyer, Amoskeag Manufacturing Company.

Vieria, N. R., Box 908, Greensboro, N. C. Textile chemist and demonstrator, Newport Chemical Works.

Junior Membership

Brainerd, Carroll, 318 Gregory Avenue, Passaic, N. J. Dyer, Waldrich Bleachery, Delawanna, N. J.

Bostick, George L., Jr., 31 East Twenty-first Street, Whitestone, N. Y. Dyer, Whitestone Dye Works.

Faust, Harold P., 1642 Sixty-eighth Street, Brooklyn, N. Y. Colorist, Ciba Company.

Fletcher, A. R., 34 Waterman Street, Providence, R. I. Dyer, Geneva Mills.

Millson, H. E., 8128 Hennig Street, Philadelphia, Pa. Dyer, Continental Dye Works.

Pattman, John H., Westwood, N. J. Colorist, Geigy Company, New York City.

Peterson, H. F., 138 Sagamore Street, Manchester, N. H. Dyer, Amoskeag Manufacturing Company.

The report of the committee in charge of securing a suitable emblem for the members of the Association gave a favorable report and they were instructed to proceed with the placing of the order. The necessary tools for the making of the emblems will be paid for by the Association, and will be the property of same. The emblems are to be secured and on sale at the coming Annual Meeting.

The Secretary was authorized to purchase 500 pin identification badges, which will be distributed at the Annual Meeting.

WALTER E. HADLEY, Secretary.

NINETEENTH COUNCIL MEETING

The Nineteenth Council Meeting of the American Association of Textile Chemists and Colorists was held Saturday, November 17, 1923, at the Engineers' Club, Boston, Mass.

The following members were in attendance: L. A. Olney, William H. Cady, W. C. Durfee, William D. Livermore, George A. Moran, W. J. Murray, B. B. Fernald, W. K. Robbins, R. F. Culver, H. Christison, W. M. Scott, A. E. Hirst, E. H. Killheffer and W. E. Hadley.

The Council voted to send out new ballots, changing the color of the paper upon which same were printed, as the former ballots were in error, inasmuch as they did not designate that only two of the Vice-Presidents should be voted upon. The first set of ballots were declared null and void.

The matter of the Annual Meeting was discussed in detail, and the subjects chosen upon which papers would be delivered, and as far as possible the names of the speakers were chosen. The Secretary was authorized to prepare the program of the Annual Meeting to be held in Providence, R. I., on December 8, 1923.

The committee who had charge of securing a suitable emblem for the Association members reported progress, and stated that these emblems would be on sale at the Annual Meeting.

The following applicants were admitted to membership:

Active Membership

Appel, William D., 1813 Varnum Street, N. W., Washington, D. C. Chemist, U. S. Bureau of Standards.

Burnham, Frank E., 93 Broad Street, Boston, Mass. Chemist, U. S. Color & Chemical Company.

Booth, James T., 89 Barclay Street, New York City. Demonstrating salesman, Geigy Company.

Elsmann, A. E., 89 Barclay Street, New York City. Colorist, Geigy Company.

Fuller, Allen R., General Laboratory, Three Rivers, Mass. Dyer.

Harvey, John E., 72 Fairview Avenue, Pawtucket, R. I. Overseer of dyeing, P. D. B. & C. Company.

Jaeger, Albert, 25 Sessions Street, Providence, R. I. Dyer, Kenworthy Company.

Ginsty, William J., 344 Olmstead Place, Glendale, L. I. Dyer, Sea Island Thread Company.

Keeler, William R., 968 Laurel Avenue, Bridgeport, Conn. Textile colorist and chemist, American Fabrics Company.

Worton, James, 333 Durfee Street, Fall River, Mass. Instructor, Bradford Durfee Textile School.

Junior Membership

Bernat, E., 4 Bishop Street, Jamaica Plain, Mass. Dyer, Studio of Emile Bernat.

Hunt, H. W., Crompton Company, Crompton, R. I. Chemist.

Demers, O. H., 25 Schuyler Street, Manchester, N. H. Assistant chemist, Amoskeag Manufacturing Company.

Stott, J. G., Jr., Ciba Company, Cedar and Washington Streets, New York City. Assistant dyer.

Sweigart, William F., 428 Franklin Street, Bloomfield, N. J. Dyer, Clark Thread Company, Newark, N. J.

WALTER E. HADLEY, Secretary.

APPLICANTS FOR MEMBERSHIP

The following is a list of names of those who are making application for membership in the Association:

Active Membership

Bayer, Richard, salesman and demonstrator, National Aniline & Chemical Company, Providence, R. I. Sponsors: H J. Daignault and R. F. Culver.

Bishop, Roy T., vice-president and manager, Oregon Worsted Company, Portland, Ore. Sponsors: M. C. Dearing and J. J. Sokolinski.

Bohl, Edward, Jr., silk dyer, National Silk Dyeing Company, Paterson, N. J. Sponsors: E. F. L. Lotte and E. A. Wideman.

Burnett, Raymond L., demonstrator and salesman, Du Pont Company, Providence, R. I. Sponsors: P. J. Arienti and H. S. Schwarz.

Clay, Tom, superintendent dyeing and bleaching, Crompton Company, Crompton, R. I. Sponsors: H. A. Matteson and R. F. Culver.

Demers, William J., boss dyer, Worcester Woolen Mill Company, Worcester, Mass. Sponsors: George O. Linberg and George Foye.

Elmore, F. H., Manager, H. A. Metz & Co., Providence, R. I. Sponsors: F. Mason and R. F. Culver.

Gardner, J. E., works chemist, Clark Thread Company. Sponsors: W. E. Hadley and H. Grandage.

Hanke, E. E., chemist, Lincoln Bleachery & Dye Works, Lonsdale, R. I. Sponsors: C. R. Ewing and R. F. Culver.

Keeler, Edwin A., colorist, Newport Chemical Works, Passaic, N. J. Sponsors: J. S. Unterweiser and C. F. Schaumann.

Lilley, S. Clarkk, dyer and chemist, Gerald Cooper, Providence, R. I. Sponsors: C. H. Stott and R. F. Culver.

Magnes, John J., overseer of dyeing, Myers, Lipman Wool Stock Company, Brooklyn, N. Y. Sponsors: J. J. Sokolinski and D. P. Knowland.

Mitchell, R. M., mill superintendent, S. Slater & Sons, Webster, Mass. Sponsors: D. Ferguson and A. J. Midwood.

Newell, Richard F., colorist, Ciba Company, New York City. Sponsors: W. E. Mitchell and D. P. Knowland.

Northup, G. A., Jr., chemist, Rockland Finishing Company, Haverstraw, N. Y. Sponsors: J. J. Sokolinski and D. P. Knowland.

Powell, John, superintendent print shop, Weiss, Willheim Company, Inc., Paterson, N. J. Sponsors: J. J. Sokolinski and D. P. Knowland.

Zillessen, Walter H., colorist, Newport Chemical Works, Inc., Passaic, N. J. Sponsors: E. H. Killheffer and Giles Low.

Junior Membership

Brosnan, W. F., student, Lowell Textile School, Lowell, Mass. Sponsors: Prof. L. A. Olney and W. E. Hadley.

Buchan, N. S., student, Lowell Textile School, Lowell, Mass. Sponsors: Prof. L. A. Olney and W. E. Hadley.

Cote, T., student, Lowell Textile School, Lowell, Mass. Sponsors: Prof. L. A. Olney and W. E. Hadley.

Donaldson, E. R., assistant chemist, Mount Hope Finishing Company, North Dighton, Mass. Sponsors: W. S. Silliams and Carrol W. Peck.

Herrman, A. E., Jr., student, Lowell Textile School, Lowell, Mass. Sponsors: Prof. L. A. Olney and W. E. Hadley.

Meeker, Samuel, student, Lowell Textile School, Lowell, Mass. Sponsors: Prof. L. A. Olney and W. E. Hadley.

WALTER E. HADLEY, Secretary.

The following have resigned as active members: John L. Dabbs and Frederic Dannerth.

CHANGES IN ADDRESSES OF MEMBERS

The following changes in addresses of members should be noted:

Allen, Woodward, care of Wing & Evans, Inc., 77 Summer Street, Boston, Mass.

Baxter, George S., 116 Railroad Avenue, Mamaroneck, N. Y.

Betz, L. Drew, c/o E. P. Drew & Co., Inc., 136 State Street, Boston, Mass.

Bromley, Frank, c/o Elms & Sellow, Inc., 230 Fifth Avenue, New York City.

Bloxham, H. C., 601 Washington Street, Wilmington, Del.

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Duffy, Edward J., care of Lebanon Chem. Co. Ind., Mill and Cross Streets, Pawtucket, R. I.

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Graham, John E., Chemical Company of America, 8 Union Street, Providence, R. I.
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Hinckley, E. H., 17 Battery Place, New York City.

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Hollander, Charles S., Rohm & Haas Company, P. O. Box 219, Bristol, Pa.

Jaeger, Jr., R. W., Y. M. C. A., Pittsfield, Mass.

Jeffries, William H., care of Kuttroff, Pickhardt & Co., 128 Duane Street, New York City.

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Johnson, Arthur O., care of Geigy Company, Inc., 46 North Front Street, Philadelphia, Pa.

Jones, Roy L., Box 36, Haworth, N. J.

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Morrison, Alex., American Woolen Company (Administration Building), Shawsheen Village, Andover, Mass.

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Nicoll, John, Imperial Cotton Mills Company, Los Angeles, Cal.

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Purcell, James, Liondale Print Works, Rockaway, N. J.

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AMERICAN
DYESTUFF REPORTER

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

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Directing Editor

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COMPETITION VS. CO-OPERATION

THE fact that the Interessen Gemeinschaft, on behalf of its plants located in the occupied area, is reported to have consummated an arrangement with the Rhineland High Commission, by virtue of which deliveries of reparations dyes will be resumed and further export trade in these products sanctioned, subject to export tax, is likely to have an extremely important reaction upon the American dyestuff manufacturing industry.

The unofficial reports of this agreement which have reached America are to the effect that the six plants in the occupied area, namely, Badische, Hoechst, Greisheim-Elektron, Bayer, Kalle and Weiler-ter-Meer, will resume reparations deliveries in kind under the Versailles treaty, including delivery of arrears for 1923. The Rhineland High Commission further, it is understood, will license exportation of the products of these plants subject to an export tax varying from 1 to 3 per cent, based on the German domestic price in gold.

Obviously, the putting into operation of a plan of this kind indicates a more or less immediate resumption of competition by German firms for business in the world markets. Owing to the tariff protection existing in this country, it is doubtful if domestic markets will be greatly upset thereby. On the other hand, it is extremely probable that our export business, which has shown signs of healthy revival during recent months, will be seriously affected.

A most interesting phase of the agreement, as reported, and one from which American dyestuff manufacturers can learn a much-needed lesson, is the fact that it is contemplated that the various German plants shall specialize on the exportation of products for the manufacture of which each is best equipped, thereby reducing internal competition to a minimum and raising efficiency in production to the highest point.

While it is perfectly true that the provisions of the Sherman law are designed to restrain domestic corporations from putting into effect anything in the nature of a combination in restraint of trade, it is nevertheless a fact that in the case of export business certain leeway has been sanctioned by the Government. It is also well known that Secretary Hoover, soon after assuming the duties of his present office, invited representatives of many leading industries to confer with him, with a view to eliminating wasteful competition and raising efficiency in production in the various industries affected.

Such an invitation was extended, at least indirectly, to American dyestuff manufacturers but, to the best of our knowledge and belief, it was allowed to remain unaccepted.

In the development of a domestic dye industry, America has had to contend with many difficulties—lack of technical knowledge, inexperience, governmental misunderstanding. One of our greatest difficulties, however, and one which there has apparently been the least effort to overcome, has been the lack of sympathetic co-operation among the dyestuff manufacturers themselves.

Now that the way is open for a resumption of German export shipments, it is quite obvious that some action will have to be taken by American manufacturers if we are to continue as active competitors for business in the markets of the world Import duties may protect us, so far as our domestic markets are concerned, from competition from abroad, but they offer no assistance in our own attempts to compete in other markets.

Yet it is probably a fact that we *could* compete anywhere in the world on bulk products—certainly in South America and the Orient, because of advantageous geographical location—if we should put into operation an apportionment of the business on these products which would allow the manufacturers best qualified to handle all, or, at any rate, the greater part of the business on their respective products. Secretary Hoover pointed the way and various individuals engaged in the dyestuff manufacturing industry have at various times advocated such procedure, but as yet nothing very definite has been accomplished.

The actuating motive of each individual dyestuff manufacturer in America would seem to be, to a casual observer, a determination to secure for himself the entire business of the country in every color which he manufactures. Such procedure, where three or more manufacturers are more or less equally well equipped on a particular product, can result in nothing but ruinous competition, with no satisfactory results accruing to any one of them. A common sense understanding looking toward the distribution of such business, however, would have diametrically opposite results, to the direct benefit of all manufacturers concerned. Incidentally, the consumer would also benefit, as it would make possible, in the cases of the specific colors affected, a reduction of prices based on large volume production.

For example, if A, B and C are each manufacturing three products—X, Y and Z—and are severally engaged in a struggle to obtain all possible business on these products, with the result that each is getting approximately one third of the potential business, it is obvious

that none of them can operate at greatest efficiency. But if through some understanding A were to discontinue the manufacture of Y and Z and make only X, B to make only Y, and C to make only Z, it is perfectly obvious that the resultant increase in business on these special products would so decrease overhead and operating costs that it would be possible for each one of the individuals to market his particular product at a profit, and, incidentally, to produce a better standardized article at a price certainly no higher, and possibly lower, than that which he must obtain under present conditions in order to cover actual costs.

In the line of intermediates, particularly, could such a plan be put into profitable operation. Where one manufacturer produces in quantity a certain intermediate essential to the manufacture of one of his bulk products and several others require it in comparatively small quantities for the manufacture of other colors, it would be far more efficient and to the obvious advantage of everyone if those manufacturers requiring smaller quantities were to purchase from the manufacturer who produced in large volume rather than to attempt the individual manufacture of the intermediate for their own requirements.

A co-operative understanding of this character would benefit not only the large manufacturers who are interested in tonnage colors, but would be of benefit to the small manufacturer producing a limited line of specialties as well. Through the operation of this plan the small manufacturer could secure his intermediates at relatively low cost from one or other of the larger producers, and could then manufacture to better advantage the limited range of colors upon which he specializes without interfering with the tonnage business which would accrue to the larger manufacturers.

Competition may be the life of trade in ordinary types of business, but in a manufacturing industry so technical and so diversified as the production of dyestuffs, co-operation of the closest sort is necessary if efficient production and low costs are to result.

Another most important reason for endeavoring to specialize on certain products is the dearth of technical talent in America available for research work. It is very well known that one of the most serious difficulties with which our dyestuff manufacturers have had to contend in the development of new products has been inability to secure the services of experienced dyestuff chemists. The practice of several concerns each competing for the market on the same colors has meant duplication of research in many laboratories at a time when other new products were badly needed by the consuming industries. If the technical talent occupied with competitive processes could be released for research along the lines of other much-needed colors, the industry, as a whole, would benefit tremendously.

It may, perhaps, be said that voluntarily to turn over the market in any single product to one individual manufacturer would place too great a temptation upon that manufacturer to exact unreasonable profits from the consumer because of the monopoly existing in his line. Possibly this is true, and, in order to secure reasonable competition, it might be wise to have a carefully restricted number of manufacturers compete for the business in all tonnage lines, but beyond this point competition is certainly ruinous and of no advantage to anyone. At the present time we have in America numberless examples of cases where five, six or more manufacturers are competing for a volume of business which almost any one of them could handle adequately, with the obvious result that there is no nourishment in it for any of them.

The Germans realize to the full the advantages of close co-operation, and are seizing every opportunity to make this advantage effective against outside competition. Our dyestuff manufacturers have organized, through the Synthetic Organic Chemical Manufacturers' Association, for unified action on matters vital to the industry. It would seem as though this body were a logical cradle in which to nurse some sort of co-operation along manufacturing lines. That so little has been accomplished up to date is perhaps because of the ridiculous spirit of mistrust, jealousy and what not, which seems to exist in the minds of many of the leading factors in the industry. So long as this spirit prevails it is our opinion that an attempt to compete with the I. G. for business in the markets of the world is that much effort wasted. The place to begin the campaign for the conquest of foreign markets is in our own dooryard.

STANDARD FASTNESS TESTS

SPEAKING at the annual banquet of the American Association of Textile Chemists and Colorists, President Olney expressed the opinion that the time has arrived for the Association to employ paid chemists to conduct the work outlined by the Research Committee.

It is undoubtedly true that only in this way will the Association be able to accomplish anything very definite along lines which the Research Committee may establish. The question of standard tests for fastness of dyed fabrics to various color-destroying agencies, with which the Research Committee has been engaged during the past year, is probably the first problem with which such paid chemists would be concerned.

There is little doubt in the mind of anyone connected with the textile coloring profession that the universal adoption of recognized tests for fastness would work to the advantage of all of us. After such tests had been adopted by the Association, however, it is our opinion that the gravest difficulty would be encountered in having them become universally recognized. It seems probable that only through some Governmental body, such as the Bureau of Standards, could such an adoption be expedited.

The U. S. Pharmacopoeia was opposed by many in the drug trade before its adoption, but to-day is generally recognized and, so far as we know, has proven

to be of advantage to all elements. In the case of dyestuffs, however, the Government laboratories are absolutely not equipped to devise fastness tests. There is no organization in the country which even approximates the ability of the American Association of Textile Chemists and Colorists along this line. In undertaking this work, however, it is our opinion that representatives of the Government, of the leading textile manufacturers and the dyestuff manufacturing concerns, should be invited to participate, at least in an advisory capacity, to the end that the results, when accomplished, should bear the stamp of approval of as large a percentage of interested parties as is possible.

If, and when, such standards were finally adopted it would be possible for the purchaser of dyestuffs to buy on a basis of definite classification for certain purposes, and there would be no argument as to whether fastness properties had been misrepresented—the question would be susceptible of absolute demonstration. Further than this, even consumers could be educated to understand that goods purchased had varying degrees of fastness and that they were paying for Class 1, Class 2 or Class 3, as the case might be, and hence know in advance what they might expect of the durability of the colors in the fabrics which they buy.

Many manufacturers of wash goods are already guaranteeing their fabrics to be "fast." How much more definite would such a guarantee be, however, if it read "Guaranteed to be of Class A Fastness to Washing and Class A Fastness to Light in accordance with the tests designated by the U. S. Bureau of Standards."

It is a tremendous subject and one of vital interest to the entire textile coloring industry, but if handled in the right way it can be settled to the satisfaction of all and to the obvious advantage of everyone.

T. C.'S COLUMN

[Editor's Note—Under the above heading we introduce a new feature of The Reporter which will appear at more or less regular intervals in the future. "T. C.'s Column" will consist of comments of a semi-editorial nature on matters of general interest to our readers. They emanate from the pen of a gentleman of thorough technical training and wide practical experience in the field of textile chemical operations who, for reasons of his own, prefers to remain anonymous. T. C.'s first contribution deals with the demonstrator, about whom we have recently had so much discussion.]

THE DEMONSTRATOR—HELP OR HINDRANCE?

OUR editor, having raised the question of dye demonstrators, has offered an opportunity to dissertate upon this broad subject, and we shall promptly make it broader by including all demonstrators. The subject certainly cannot be dismissed by any statement that these gentlemen are good or bad, for they are of varied talents and uses. Personal experience has shown them to be quite useless in some fields, a great help in others and essential in some special cases. Speaking of mills with good technical talent, there is little if any need of demonstrators for working up ordinary new shades. And a fairer judgment of *values* can be reached if the work is done independently.

In an emergency in some specialized form of dyeing, the demonstrator is not of much use because he has to study the subject rather thoroughly before he can do anything. Local talent can do better (if existing and given a fair opportunity).

If some method of dyeing is to be taken up, new to the mill, although perhaps a common practice in the trade, then outside aid will save much time and trouble. Again dyers may gradually work away from standard methods of doing things and a check-up by an outsider will carry weight in getting back.

With proprietary finishing materials, etc., the demonstrator is more often essential than with dyes, but in introducing indanthrene printing and vat dyeing on cotton piece goods, progress would have been much slower without the competent technical men in these fields. In finishing it is not easy to cite a general case, but the point is well illustrated by a personal experience where an oil which embodied a principle new at the time did not work quite as it should. The demonstrator knew how it was made and how to fix it. Without him certain desired results and economies would not have been effected.

Is the demonstrator a gossip or a pirate? In a sense each is more or less on his honor, but where a man covers a great amount and variety of work he cannot always recall that certain things are confidential, however good his intentions may be. On the other hand, the old idea that you can find out anything about anybody's business by buying a few pounds of dye was exaggerated, but still it had quite an element of truth. Certain things cannot be kept quiet and their spread is unavoidable while the fact that some mill with a reputation is using a dye is one of its best talking points, and is not likely to be overlooked.

Any mill that has real secret processes that are worth anything ought to have sense enough to have chemists or dyers of their own, good enough to handle their work. If they are too small they will naturally have to take their chances. If they don't know enough to develop their own talent they do not deserve much sympathy. Everybody ought to know that the only way to protect the few things that are really confidential is to keep people out.

If reasonable efforts are made to protect a secret process and a service man deliberately tries to pry into it, he is not fit for his work and the obvious thing should be done.

The way of the demonstrator is not always made easy by the mills. How often have novel dye applications been established only to have the mill switch to a com-

petitor as soon as the proper dye types became known? What more natural than that the same thing be offered to some other mill?

Whether the demonstrator pays his way in terms of sales is a matter for the dye manufacturer to figure out for himself. If not, he will ultimately become extinct.

There is something to be said, too, for the technical *salesman*. Probably purchasing agents don't care, but to one who is familiar with dyes there is nothing less inspiring than to talk to a salesman who has a clever line of talk but who has to run to a technical man as soon as you ask him a few questions. The salesman should be able to tell his customer all about the line of dyes, and if need be help him out in using them. Such a man could serve as both salesman and demonstrator if the latter is not needed full time. His services would, perhaps, be seldom required by the larger and better equipped plants that have chemical staffs, but on the other hand would be of real service to many small mills.

The maintenance of service men is a tax on all dye consumers, for although it may be passed on down the line, the textile plants have to pay the dye manufacturer's sales expenses. He who has frequent recourse to demonstrators more than gets his money's worth, while the mill that depends entirely on itself helps pay for something that it does not get. However, we suspect that there is an equalizing tendency in the adjustment of dye prices. At least, there should be.

There's another aspect of the case of interest to the textile chemist. At the risk of getting out of order, we are going to say that many good-sized mills are like typical Americans in trying to dodge direct taxes, while paying far more in indirect taxes without a murmur. A point is reached in the size of mill, where not hiring a competent chemist is folly, for this direct expense may be spent several times in supplies priced to cover demonstrator's services. This is an indirect expense and not noticed, but in the end the consumer pays the "freight." Competition is easier if there is not too much of it.

There are points for the negative, which may be at times quite important. Friendly demonstrators have kept a good many poor dyers in their jobs, presumably on the friend-at-court theory, or because "a bird in the hand is worth two in the bush." We hope and believe that this practice is on the wane.

In case of competition the presence of a demonstrator at the tests will tend to favor his goods. Opinions on the subtle differences of dye, feel or finish are easily influenced. Whether this does or does not favor the interests of the mill in particular cases, it will be found after enough trials for the law of averages to get in its work, that the mills own competent men are better where decisions are required on quality or value.

Finally, we should not overlook the fact that experienced demonstrators are among the best of trouble men, for although they may not personally have performed every possible operation or run into every form of difficulty, their wide experience has given them good judgment in where to look for trouble and an alertness to catch hidden faults. Many mills will testify to such valuable service where immediate sales were not an issue.

Now having hastily sketched the case, we finally conclude that with all their good and bad points, demonstrators as a group are of great value because, whether intentionally or not, they tend to spread the best practice in all their lines, and to that extent, they elevate the whole indusry. T. C.

Annual Meeting of Synthetic Organic Chemical Manufacturers' Association

THE annual meeting of the Synthetic Organic Chemical Manufacturers' Association of the United States was held at the Hotel Commodore, New York, on Friday, December 14th.

The morning session was opened by the President, Dr. Charles H. Herty, with a few words of welcome to the assembled members and several guests who were in attendance. He then introduced the first speaker, Col. J. I. McMullen, Judge Advocate in charge of the patents division of the War Department who spoke on the subject of "Patents in Relation to the Chemical Industry."

Colonel McMullen discussed the important part which alien-owned patents had played in the late war and called attention to the fact that prior to the outbreak of hostilities pracically all chemical patents of importance were German owned. He stressed the fact that patent legislation runs side by side with tariff legislation as a means of protecting the organic chemical industry; that if essential patents are allowed to become registered in the names of aliens no amount of tariff legislation can assure the permanent development of the industry. He recommended a revision of the patent laws in such a way that it would be possible for the Government to license or, in fact, require the American operation of foreign-owned patents if such action seemed necessary to the preservation of industries essential to American industrial independence.

Dr. Wilder D. Bancroft, Professor of Chemistry at Cornell University, was the second speaker. His topic was, "The Fastness of Dyes to Light." Professor Bancroft talked most interestingly on the subject of the chemical influences which affect dye fastness and advanced some novel theories to account for the results encountered in certain light-fastness tests. His remarks will be published in full in The Reporter in the near future.

Following Dr. Bancroft, Dr. Herty introduced C. C. Concannon, of the Chemistry Division, Department of Commerce. Mr. Concannon described the work of his department in detail, mentioning in particular the monthly lists of imported dyes which is prepared by them. Like many governmental bureaus, the personnel of this department is limited, but a tremendous amount of con-

structive work is carried on, nevertheless. Mr. Concannon said that a report on the German Chemical Industry prepared after careful study of the situation in Europe was soon to be published, and that it would be followed by similar reports covering chemical activities in other foreign countries.

At the conclusion of Mr. Concannon's remarks an adjournment was taken for luncheon. There were present as the Association's guests, Daniel F. Waters, President of the Master Dyer's Association of Philadelphia and Francis P. Garvan, President of the Chemical Foundation, Inc. Dr. Herty introduced Mr. Waters as one who had championed the American dye industry in its infancy and suggested electing him an honorary member—an honor which had been conferred on Mr. Garvan a year ago. This was accordingly done amid applause

Mr. Waters thanked the Association and urged them to continue the good work they had so well begun. He said that in his own mill he found American dyes the equals of any and declared that if we continue to progress as we have done in recent years we need fear competition from no nation on earth.

Dr. Herty then introduced Mr. Garvan, who spoke most eloquently of the work done by American chemists toward making our country independent of foreign nations in such important matters as explosives, synthetic medicines and dyes. He stated that he was informed upon reliable authority that it was recently the plan of the German Cartel to effect the domination of the American dye industry by virtue of each German unit making an investment in the plant of an American manufacturing concern and an alliance for the manufacture here of German products—the ultimate aim being, when such alliance had been completed, the scrapping of the American industry. He was glad to report that efforts in this direction had been firmly rebuffed by American manufacturers and said he believed that this "partnership of aliens in the arsenals of America" had been effectively quashed. He voiced the expectation that the next move of the I. G. would be to build or purchase plants of their own for dyestuff manufacture in America, but was confident that "we are ready for the challenge."

After luncheon the Association reconvened for its annual business meeting. In his opening remarks Dr. Herty reviewed the activities of the Association during the past year. He said that the period had been one of marked development from every angle. Finances were in excellent condition, the Association having no unpaid obligations and a very comfortable balance in the treasury. Through the efforts of the Association, working in cooperation with the Treasury Department, 302 dyes had been added to the original list of competition colors. Twenty appeals had been taken from adverse customs appraisals, of which nineteen had been won.

Dr. Herty praised in the highest terms the work of Harrison F. Wilmot as Technical Adviser to the Association. He said that Mr. Wilmot's exceptional technical knowledge, coupled with his unflagging energy and diplomatic methods, had been of inestimable value to the Association. This tribute was received with applause.

Dr. Herty outlined the progress which had been made in putting the American dyestuff industry in a proper light before the public. Speaking of the wholesome spirit of co-operation which exists among members he cited an instance of the exhibit staged at the recent Chemical Exposition. Although this exhibit was largely financed by contributions of individual members, not one of these contributors suggested the advertising of their respective dyes, the slogan being, "American Dyes Are Fast."

Speaking of the tariff, Dr. Herty said that he was informed by representative leaders in the House that no changes in current schedules were likely to be undertaken by the present Congress.

Dr. Herty urged the members to concentrate on filling the gaps still existing in America's line of fast dyes. He said he had information in regard to the research and manufacturing programs of several of the leading manufacturers which was most encouraging in this direction.

At the conclusion of Dr. Herty's remarks, rising votes of thanks were tendered separately to him, to Mr. Wilmot and to the Association's counsel for their services in behalf of the Association.

Dr. F. P. Summers reported as Treasurer for the year just ended. In accepting his report, the Association tendered him, also, a rising vote of thanks for his loyal and gratuitous services.

The various sections of the Association then proceeded to elect vice-presidents and representatives on the board of governors for the coming year, with the following results:

Dyestuffs Section—Vice-President, August Merz; Governors, F. P. Summers, G. H. Whaley, C. N. Turner and A. J. Farmer.

Intermediates Section—Vice-President, S. W. Wilder; Governors, W. F. Harrington, W. S. Weeks and R. N. Wallach.

Fine Organic and Medicinals Section—Vice-President, G. F. Richmond; Governors, A. S. Burdick and R. E. Dorland.

Special Chemicals Section—Vice-President, P. S. Rigney; Governor, G. H. Roll.

Reconvening as a whole the Association re-elected for the coming year Dr. Charles H. Herty as president and Dr. F. P. Summers as Treasurer and thereupon adjourned.

Coal-tar Products in the Netherlands.—There has been a rather rapid and otherwise notable development of the manufacture and exportation of coal-tar products in the Netherlands in the past two years, according to Consul-General George E. Anderson at Rotterdam. Approximately twenty-five factories are listed in the country at present as manufacturing some product connected with coal-tar, ranging from roof paint and asphalt paper to the finest chemical products.

AMMONIA AND AMMONIUM SALTS IN BLEACHING AND DYEING

(*Continued from page* 910)

decomposed, however, and they must therefore be first decomposed so as to form ammonium salts. This decomposition is most readily brought about by concentrated sulphuric, and the method is generally known as the Kjeldahl method. It consists of digesting the nitrogenous matter with an excess of concentrated sulphuric at a temperature approaching its boiling point. All the nitrogen is thus converted into ammonium sulphate, and this can be estimated by distilling the resulting product with excess of caustic soda and collecting the ammonia.

Hence in the determination of the nitrogenous matter in bleached or other fabric it is most convenient to treat it by the Kjeldahl method, since some of the nitrogen present is almost certain to be in a form other than that of an ammonium salt. The estimation should therefore be carried out as follows:

About five grams or less of the fabric, cut up in small pieces, should be placed in a Kjeldahl flask and fifty grams of concentrated sulphuric acid then added. A further addition of ten grams of potassium sulphate

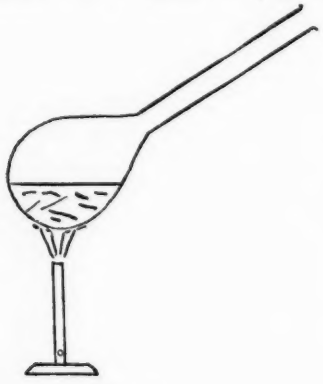

FIG. 2.

should also be made. When the fabric is thoroughly saturated with the acid (sometimes a little more acid may require to be added) the flask should be fixed in a sloping condition (Fig. 2) and heated directly with a small Bunsen flame. At first care in the heating will be required, since the mixture often forms a considerable froth, but afterwards the acid mixture should be heated more strongly for four to six hours until a perfectly colorless solution is obtained. The nitrogenous bodies have then been converted into ammonium salts.

A small excess of caustic soda should then be added to the contents of the Kjeldahl flask, and a U bend connected to it, with attached condenser, as shown in Fig. 3. The alkaline liquid is then boiled and the ammonia passes over into the flask C, which contains a measured quantity of $\frac{N}{10}$ sulphuric acid. Care must be taken that all the distillate passes into the acid and that no leakage or loss of ammonia occurs. When most of the liquid (and the ammonia also) has distilled, the condenser should be washed down with distilled water, and the contents of the flask C titrated with $\frac{N}{10}$ caustic soda, using methyl orange as an indicator. The decrease of acidity is due to the absorption of ammonia, and it may be remembered that:

$$1 \text{ c.c. of } \frac{N}{10} \text{ Sulphuric acid} = \begin{matrix} 0.0014 \text{ grams of nitrogen} \\ 0.0017 \text{ grams of ammonia} \end{matrix}$$

It will be noticed that the Kjeldahl digestion is lengthy —usually at least four to six hours. To shorten this period, Uhl has suggested that nitrogen-free hydrogen peroxide should be added in quantities of 2 c.c. to the

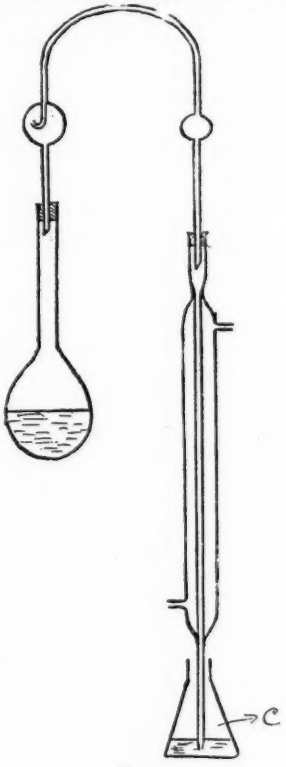

FIG. 3.

acid mixture in the early stages. In practice it will be found that with this modification the period of digestion can be reduced to about one hour, so that the whole process can be readily carried out within two hours.

Of the various ammonium salts which are utilized in bleaching and dyeing, such as ammonium chloride (for aniline black dyeing) and ammonium sulphocyanide (in printing), it is not necessary here to describe them in further detail. It may be remarked, however, that their content of ammonia may be estimated by the method previously indicated—distillation with caustic soda, absorption of the evolved ammonia in acid, and determination of the amount of acid thus neutralized.—Dyer and Calico Printer.

Importance of Chemistry in Textile Industry Shown at Meeting of Society of Chemical Industry

Chemistry Important in Textile Technology—Constitution of Dyestuffs—Chemical Constitution and Color of Various Dyestuffs—Composition and Fastness of the Shade—Oxy Derivatives of Anthraquinone—Drugs, Dyes and Perfumes—Their Interrelation—Chemistry of Cotton Finishing—Mercerization—Weighting, Softening and Thickening—Producing Shadow Stripe in Cloth

THE meeting of the Society of Chemical Industry, which was held on Friday evening, December 7, 1923, at the Chemists Club in New York City, was devoted entirely to textiles. One of the papers dealt with the finishing of cotton goods and the other with dyestuffs. The underlying sentiment and the keynote of both addresses was the importance of chemistry and chemical principles in the textile industry.

The average textile man may know something about chemistry and may have read or had personal experience to bring home to him the importance of this science in the textile industry, but it is safe to say that the real function of chemistry in controlling and perfecting textile processes is appreciated in its full worth by but few textile men. It is only necessary to review the different textile operations that are carried out in the spinning and weaving mill, in the finishing plant, the bleachery and print works and in the dyehouse, to discover that there are certain important processes which cannot be carried out properly unless they are placed under strict chemical control. It is true that many, rather the majority of textile operations, are purely mechanical in nature and not dependent on chemical change, but where chemical change does take place the results that are obtained by it are so important, so pertinent to the finished appearance of the goods and hence to their salability, that the utmost care must be taken with those changes or else poor products are obtained. The textile man must not think that just because the chemical changes that are brought about in the textile fiber are apparently simple and few that they need need not be given careful attention.

Chemistry Important in Textile Technology

Chemistry plays an important role in textile operations, and chemical principles must be thoroughly understood and their application carefully supervised in order to obtain really efficient results. Furthermore, the field is practically virgin; there has been research done on various textile problems, but there are still a great many that have remained unsolved. Many times the action of certain chemicals or other substances on the textile fiber is known to produce certain definite results without the process or phenomena that brings about these results being understood in any way. In comparison with other industries in which chemical changes are evoked in raw and intermediate products and in which chemical principles of all kinds are evolved, it must be said that the textile industry has not been as thoroughly developed along the lines of chemical research as it might and should and as it must eventually, in order to put the manufacturing processes on a strictly scientific basis.

Constitution of Dyestuffs

One paper, read before the aforementioned meeting, was prepared by Dr. B. Wuth, of the Ciba Company, on the subject: The Relation of Chemical Constitution to Shade and Fastness of Organic Coloring Matter. Perhaps the importance of the chemist in this respect is so evident that it does not require emphasis, but the fact that chemical and scientific investigations have evolved a system whereby it is possible to tell something about the color of a dye as well as its fastness from a study of the chemical composition, is a very important step in the progress and development that has taken place in the dye and dyeing industry. It is no longer a mere matter of guesswork on the part of the chemist in determining the advisability of performing this or that operation in making a new dyestuff. He is guided now by practical principles which make it possible for him to foretell just what kind of a dyestuff he is going to obtain and what color he will get by adding this or that chemical group to his product. This is perhaps a most significant service that chemistry has rendered the textile industry in facilitating the production of dyestuffs, in improving the quality of the product, in giving the experimenter tried lines along which to work and thus enhancing the possibilities of the discovery of new dyestuffs.

Chemical Constitution and Color of Various Dyestuffs

Dr. Wuth's paper was taken up with a discussion of the various ways in which the composition of a dyestuff, its color and the fastness of the shade may be interrelated. Various examples were cited and each and every important class of dyestuff was considered individually.

As is known, dyestuffs are made from simple chem-

icals. They are complex substances built up from the simple aromatic hydrocarbons. The chemists have been able to differentiate a series of chemical groups which they know will produce dyes when used in the proper manner. Thus there have been singled out about twenty chemical groups which are known by the name of chromophors. This means, literally, color bearers. When these groups are added to the simple hydrocarbon, such as benzene, toluene, xylene, etc., a dye is not obtained but a substance which can generate a dye by still further treatment. These substances are known as chromogens. Chromogens can contain one or more chromophors in all sorts of conditions and combinations. When the chromogen compound is coupled with an auxochrome group, principally the amino group NH_2 and the hydroxyl group OH, which are most active, a dyestuff is produced. The great number of possible combinations make the number of possible dyestuffs unlimited. As Dr. Wuth said, it is undoubted that all the possible dyestuffs will never be discovered.

The idea of determining a color by chemical constitution is based on the chromophor and auxochrome substitution on the molecule as explained above. Thus in the case of the triaryl methyl dyestuffs, the chromogen is fuchsone, which is changed into fuchsamine, a dye, by the addition of an auxochrome, coloring-increasing group. The effect the addition of a radicle may have on the color is clearly illustrated by the addition of an alkyl radicle to the dyestuff fuschine red. It is immediately changed into a blue coloring matter. Similarly the addition of a benzyl radicle, benzylation, will change the color of the dye. There are many other radicles which will do the same thing.

Composition and Fastness of the Shade

On the other hand, it is interesting to note that it has been determined that certain certain groups, when added to the molecule under certain conditions, increase the fastness of the coloring matter. Sulphonation, the addition of the sulphonic acid radicle, SO_3H, will do so. A good example of the effect of the addition of the salicylic acid group on the fastness of the shade is seen in the case of the triphenylmethane dyestuffs. These are not strong, but the introduction of the salicylic acid group in either one, two or three places, makes these dyestuffs fast to light and washing.

In his paper Dr. Wuth systematically discussed the various classes of dyestuffs, acid, basic, mordant, etc., showing how in each class the addition of certain chemical groups could be used to produce definite color and fastness. Thus in the case of the sulphur dyestuffs, it is known that the manufacture of these dyes from para compounds gave blacks, that from meta compounds brown and yellow, etc. The relation between color and constitution is not easy to find in the indigo and vat series of dyestuffs. However, it is known that the color of indigo can be changed by the addition of various radicles in different positions in the indigo molecule.

Oxy Derivatives of Anthraquinone

The dyestuffs which are oxy derivatives of anthraquinone, represent a very excellent example of the effect of position of the two hydroxyl groups on determining whether or not the compound is a dye. The series is made up as follows:

Erythroxy anthraquinone	1
Alizarine	1, 2
Purpuroxanthine	1, 3
Quinizarine	1, 4
Anthrarufine	1, 5
Chrysazine	1, 8
Hystazarine	2, 3
Anthraflavinic Acid	2, 6
Iso Anthraflavinic Acid.....	2, 7
Anthragallol	1, 2, 3
Purpurin	1, 2, 4
Anthrarufin Bordeaux	1, 2, 5
Flavopurpurin	1, 2, 6
Isopururin	1, 2, 7
Alizarine Bordeaux	1, 2, 5, 8
Anthrachrysone	1, 3, 5, 7
Alizarine Cyanine R.....	1, 2, 4, 5, 8
Rufigallol	1, 2, 3, 4, 5, 6, 7
Anthrazone Blue WR.....	1, 2, 3, 4, 5, 6, 8

In this series the dyestuffs are italicized and in each case the two hydroxyl groups are in the 1, 2 position. None of the other compounds are dyestuffs.

Drugs, Dyes and Perfumes, Their Interesting Interrelation

After Dr. Wuth's talk, Dr. Marston T. Bogert, of Columbia University, had a few interesting remarks to make about the important relation that appears to exist between dyes, drugs and perfumes as far as the properties of these substances and their chemical constitution are concerned. The dye chemist initiated this work by determining the fact that composition had something to do with color. Now the drug chemist is finding that the composition of the drug bears a direct significance to its physiological potency, and that the chemical makeup of the perfume molecule will yield some information as to the kind and intensity of odor that it will yield. It is a strange fact that the very same radicles, which are so powerful in producing color, namely the amino NH_2 and the hydroxyl radicles, are the ones that will produce the finest perfumes and the most physiologically potent drugs. He mentioned that in experimentation to develop a new drug or perfume, it sometimes happened by some slight change in the operation, made unconsciously, a dye was produced instead. This hints of a close relationship that must exist between these classes of substances.

Chemistry of Cotton Finishing

Perhaps the importance of chemistry to the textile in-

dustry was brought home more closely in the paper read by J. F. Warner, of the Bronx Company, on the Chemistry of Cotton Cloth Finishing. In his paper Mr. Warner gave a brief survey of the operations involved in the finishing of cotton goods that had a chemical nature. There are three such operations, bleaching, mercerizing and dyeing. The latter may be considered slightly out of the field of cotton finishing and hence it was not discussed.

The reason why chemistry enters into the finishing of cotton goods is to be found in the simple fact that the cotton fiber in the form of cloth contains about 4 per cent of impurities, natural waxes, resins, oils, fats and coloring, besides various starchy and gummy substances, oils, paraffin and other materials that are added by the weaver to enable him to weave the cloth. In order to obtain a fine white product or a dyed cloth which is not spotty and irregular in color, these substances must be thoroughly removed from the cotton fiber.

There are two ways of doing this according to the use to which the finished cloth is going to be put. If it is to be sold in the white, it is generally desirable to have a linen-like finish to it. For this purpose the lime process is best. On the other hand, when the white goods are to be printed or dyed and just an ordinary product is to be produced, it is more advisable to use the shorter and less expensive caustic soda process. In the first case the goods will take considerable weighting matter, while in the second they will not.

The lime process is used for making white goods because lime is the most potent chemical agent for the removal of the various fatty, waxy and oily matters that contaminate the cotton fiber in the gray cloth. The impurities are saponified by the treatment and then the lime is washed out, the goods are treated with hydrochloric acid, washed and then given a treatment with soda ash solution and finally washed again. They are then ready to be bleached. The function that chemistry plays in this process is to indicate the advisability of using this method in place of the caustic soda process.

As has been said, the latter process is shorter. It does not give a so uniformly cleaned product due to the fact that the alkali does not act evenly on the fabric. In carrying out this process it is necessary to exercise careful chemical control to see that the proper strength of solution is used. A specific gravity determination is not sufficient; it is advisable to make a chemical analysis of the solution of alkali.

Mercerization

Mercerization, as is well known, consists in the action of a strong cold solution of caustic soda on the cotton fiber. The strength of the caustic solution must be carefully controlled. The action of the caustic is understood to be one of combination with the cellulose molecule, forming a compound which easily decomposed to give an oxycellulose. The physical effects of the treatment are readily evident. The twisted structure of the cotton fiber is changed to that of a straight transparent tube. Chemical control is absolutely necessary in mercerization, and a knowledge of the conditions under which the caustic soda solution will act to give the best results is requisite. It is known, for instance, that the presence of starch in the cotton fiber is objectionable. It must first be removed before a good grade of mercerized fabric can be obtained.

Weighting, Softening and Thickening

In these operations various substances are used and applied to the fabric by purely mechanical processes. Nevertheless, the character of the substance must be carefully considered before it is used. Thus, for example, in using china clay for weighting the fabric, it is necessary to see that it is free from iron salts, which will discolor the fabric. Thickening agents are commonly different forms of starch, all of which give different effects. The softening agents are various mineral, vegetable and solubilized oils. It would be advantageous to know just what is the action of soluble oil on the fabric, but this still remains one of the unsolved chemical problems in cotton goods finishing.

Producing Shadow Stripe in Cloth

After the reading of Mr. Warner's paper the discussion developed the manner in which the shadow stripe is produced in cotton fabrics. Dr. Flynn answered and said that there were three different ways of doing this, weaving, printing and mechanical treatment of the finished cloth. The first process is self-explanatory. The second consists in printing the goods in stripes with a strong cold solution of caustic soda and producing mercerization. Another method employs a solution of acetylx cellulose. The mechanical treatment consists in passing the cloth between heavy steel rollers, engraved in fine lines. The effect produced by these rollers is temporary only, as the first washing removes the shadow stripe. Partial waterproofing may be used to retain this mechanical effect.

At Los Angeles, Cal., the Jenkins-Wright Co., Inc., has purchased four acres of land in the City Industrial Tract, where they will start immediately to build a large yarn dyehouse, to be completed within six or eight months. While the buildings that are to be erected will not occupy the entire site, they will represent an investment of $200,000. The firm has under contemplation additional units to be used for dyeing piece goods, and it is thought that definite plans for this enterprise will be announced in the near future. The Jenkins-Wright Company was organized five years ago. Mr. Jenkins, the president, was for twenty-three years head of the City Dye Works, which he has recently sold.

Foreign Dyes Imported Through the Port of New York During November

Compiled by the Chemical Division of the Bureau of Foreign and Domestic Commerce, in Collaboration with the Chemical Division of the United States Tariff Commission

KEY TO ABBREVIATIONS FOR FOREIGN MANUFACTURERS

1—The Six Leading German Companies

A—Actien-Gesellschaft fur Anilin-Fabrikation, Berlin. Founded 1873. Branches in France and Russia.
B—Badische Anilin-and Soda-Fabrik, Ludwigshafen on the Rhine. Founded 1865. Branches in France and Russia.
By—Farbenfabriken vorm. Friedr. Bayer & Co., Leverkusen on the Rhine. Founded 1862. Branches in France and Russia.
C—Leopold Cassella & Co., Frankfort on the Main. Founded 1870. Branches in France and Russia.
K—Kalle & Co., A. G., Biebrich on the Rhine. Founded 1870. Branches in Russia.
M—Farbwerke vorm. Meister Lucius & Bruning, Hochst on the Main. Founded 1862. Branches in France and Russia.

2—The Seven Smaller German Companies

BK—Leipziger Anilinfabrik Beyer & Kegel, Furstenberg near Leipzig. Founded 1882.
GG—Chemikalienwerk Greishem G.m.b.H., Griesheim on the Main. Founded 1881.
CJ—Carl Jager G.m.b.H., Anilinfarbenfabrik, Dusseldorf. Founded 1823.
GrE—Chemische Fabrik Griesheim-Electron, Offenbach on the Main. Founded 1842.
L—Farbwerk Muhlheim vorm. A. Leonhardt & Co., Muhlheim on the Main. Founded 1879. Branch in France.
tM—Chemische Fabriken vorm. Weiler ter Meer, Uerdingen on the Rhine. Founded 1877.
WD—Wulfing, Dahl & Co., A. G. Barmen. Founded 1842.

3—Dutch, Belgian and French Companies

FA—Farbwerk Ammersfoort, Ammersfoort, Netherlands. Founded 1888.
NF—Niederlandische Farbe-und Chemikalienfabrik Delft, Netherlands (Delft). Founded 1897. Branch in Russia.
LG—Lazard Godchaux, of Brussels. (These products are probably compounded largely from the dyes made by A. Wiescher & Co., of Haeren, Belgium.)
P—Societe Anonyme des Matieres colorantes et produits chimiques St. Denis (formerly A. Poirrier), St. Denis, near Paris, France. Founded 1830.

4—Swiss Companies (all at Basel)

DH—Farbwerke vorm. L. Durand, Huguenin & Co. Founded 1871. Branches in Germany and France.
G—Aniiinfarben-und Extract-Fabriken vorm. Joh. Rud. Geigy. Founded 1764. Branches in France, Germany and Russia.
I—Geselfschaft fur chemische Industrie., Founded 1885. Branch in France.
S—Chemische Fabrik vorm. Sandoz & Co. Founded 1887.

5—English Companies

BAC—The British Alizarin Co., Ltd. Established 1882.
ClCo—The Clayton Aniline Co., Ltd., Clayton, near Manchester. Founded 1876.
CR—Clauss & Co. (formerly Clauss & Ree), Clayton, near Manchester. Founded 1890.
CV—Colne Vale Chemical Co., Milnsbridge, near Huddersfield.
RHS—Read Holliday & Sons, Ltd., Huddersfield. Founded 1820. (Purchases by British Dyes, Ltd.)
BD—British Dyes, Ltd. Founded 1915.
Lev—Levinstein, Ltd., Crumpsall Vale, near Manchester. Founded 1864.
Q—Importations of unknown source, through dealers in colors.

THE imports of coal-tar dyes for November, 1923, totaled 278,673 pounds, with an invoice value of $289,689. The following table shows the monthly imports through the Port of New York for the year 1923:

Month	Pounds	Value
January*	179,309	$185,344
February	191,709	199,690
March	312,809	301,436
April	242,022	256,751
May	261,869	292,340
June	247,174	257,803
July	144,687	142,428
August	178,164	194,164
September	124,665	128,544
October	267,556	257,084

*Not complete.

In addition to the above imports of dyes through the Port of New York, the following imports were reported for the month of November through Boston and Cincinnati: Boston, 10,677 pounds, valued at $13,461, and Cincinnati, 1,479 pounds, valued at $376.

The five leading dyes in quantity imported were: Indanthrene Yellow G, 21,014 pounds; Indanthrene Golden Orange G, 15,788 pounds; Erioglaucine, 11,802 pounds; Indanthrene Golden Orange R, 11,478 pounds, and Indanthrene Blue GCD, 10,920 pounds. Of the total quantity imported in November, 1923, 52 per cent came from Germany, 29 per cent from Switzerland, 8 per cent from France, 5 per cent from Italy, 3 per cent from England, 2 per cent from Canada and 1 per cent from other countries.

The imports of synthetic aromatic chemicals for November totaled 5,786 pounds, with an invoice value of $9,339. The imports of medicinals, photographic developers and other coal-tar chemicals for the month of November totaled 81,583 pounds, with a value of $45,332, and the imports of color lakes totaled 2,374 pounds, valued at $1,975.

The dyes in this report are grouped by Schultz numbers, and in the case of those which could not be identified by Schultz number the classification according to the ordinary method of application was adopted. As the pastes and powders of the vat dyes vary widely in strength and quantity, each vat dye has been reduced—in nearly every case—to a single-strength basis.

The designation "†" for *competitive*, and "*" for *noncompetitive*, indicates the appraisement basis for the assessment of the ad valorem duty in paragraph 28 of

the Tariff Act of 1922. Those dyes without designation are doubtful, pending further investigation.

The ad valorem rate for competitive dyes is based on the American selling price as defined in Subdivision (f) of Section 402 of Title IV; the ad valorem rate for non-competitive dyes is based on the United States value as defined in Subdivision (d) of Section 402 of Title IV of the Tariff Act of 1922.

Schultz No.	Name of Dye and Manufacturer	Quantity (pounds)
21	Pigment Chrome Yellow L	100
	Pigment Chrome Yellow L Paste—(M)	
22	†Xylene Light Yellow	6,613
	Xylene Light Yellow 2G Conc.—(S)	
25	Dianil Yellow 3G	100
	Dianil Yellow 3G—(M)	
28	Hansa Yellow	1,120
	Hansa Yellow G Paste—(M)	
48	Alizarine Yellow G	534
	Alizarine Yellow 2G Paste—(M)	
	Alizarine Yellow 5G Paste—(I)	
	Alizarine Yellow 2G Paste—(I)	
58	Alizarine Yellow R	20
	Alizarine Yellow R Paste—(I)	
84	Azochromine	55
	*Azochromine XR Paste—(G)	
117	Erica 2GX	100
	Erica 2GX—(A)	
140	Curcumeine	110
	*Chromocitronine 3R—(DH)	
154	Palatine Chrome Brown	700
	Palatine Chrome Brown RX—(B)	
159	Acid Alizarine Black	2,000
	Acid Alizarine Black R—(M)	
175	Acid Ponceau	220
	*Acid Ponceau E 640—(G)	
180	Eriochrome Blue Black B	2,205
	*Eriochrome Blue Black G—(G)	
182	Brilliant Sulfon Red	2,111
	†Brilliant Sulfon Red B—(S)	
	†Fast Sulfon Violet 5BS Conc.—(S)	
206	Diphenyl Catechine	750
	*Diphenyl Catechine G Supra—(G)	
207	Diphenyl Fast Brown	3,717
	*Diphenyl Fast Brown GXC—(G)	
220	Palatine Black	3,000
	†Wool Black GRF—(A)	
222	Janus Yellow G	100
	Yellow JG—(M)	
240	Janus Red B	500
	Red JB—(M)	
274	Diaminogene B	1,100
	Diazo Indigo Blue 2RL—(By)	
306	Pyramine Orange 3G	3,000
	Ignamine Orange 3G—(B)	
358	Diphenyl Red	2,736
	*Aceto Purpurine 8B—(B)	
	*Toluylene Red Powder—(GrE)	
373	Congo Orange	50
	Congo Orange R—(By)	
392	Toluylene Orange	1,406
	*Pyrazole Orange G Conc.—(S)	
424	Chicago Blue 6B	55
	†Chloramine Sky Blue RF—(S)	
449	Trisulphon Brown	5,953
	*Trisulphon Brown B. Conc.—(S)	
456	Benzo Fast Blue	1,085
	Benzo Fast Blue 4GL—(By)	
	†Benzo Ligght Blue 4GL—(By)	
500	Setopaline	1,433
	*Setopaline Conc. 707—(G)	
506	Erioglaucine	11,802
	Erioglaucine—(G)	
	Erioglaucine A—(Q)	
	Erioglaucine Supra Conc. 546—(G)	
523	Fast Green	220
	*Fast Green Extra Bluish—(By)	
543	Patent Blue	6,189
	†Carmine Blue V—(I)	
	Patent Marine Blue LE—(M)	
545	Patent Blue A	500
	Brilliant Acid Blue FF—(By)	
546	Cyanol	1,036
	Cyanol Extra—(C)	
548	Acid Violet 6BN	50
	†Acid Violet GENG 553—(G)	
559	Victoria Blue B	500
	Victoria Pure Blue BO—(B)	
562	Fast Acid Blue	15
	Wool Blue N Extra—(By)	
571	Rhodamine 6G	1,102
	*Rhodamine 6G Extra—(I)	
573	Rhodamine B	2,250
	†Rhodamine B Extra—(B)	
	Rosazeine B Extra—(M)	
579	Xylene Red B	110
	*Xylene Milling Red B Conc.—(S)	
606	Phosphine	5,622
	†Patent Phosphine G—(I)	
	Coriophosphine OX Extra—(By)	
607	Rheonine	40
	Runic (Rheonine) AL Conc.—(B)	
	Runic (Rheonine) GD—(B)	
608	Euchrysine	1,399
	Patent Phosphine GRNTX—(B)	
	Euchrysine GRNTX—(B)	
613	Quinoline Yellow	1,598
	†Quinoline Yellow Conc.—(S)	
617	Columbia Yellow	441
	†Diphenyl Chlorine Yellow Supra FF —(G)	

Schultz No.	Name of Dye and Manufacturer	Quantity (pounds)
618	Thioflavine T	636
	Thioflavine T Powder—(Q)	
	Thioflavine TCN Powder—(Q)	
661	Thionine Blue	3,646
	Thionine Blue G—(I)	
	Thionine Blue Gold—(M)	
663	New Methylene Blue	1,000
	*New Methylene Blue N—(C)	
	*New Methylene Blue NSS—(C)	
673	Azo carmine B	621
	Azo carmine BX—(B)	
	*Rosinduline 2B Bluish—(K)	
681	New Fast Gray	2,172
	*Direct Gray R Paste—(G)	
687	Rosolane O, T, R	5
	Rosolane O Powder—(M)	
747	Thional Brown	5,004
	*Thional Brown G—(S)	
754	Kyrogene Violet 3RX	410
	Kurgau Violet 3RX—(B)	
759	Anthraflavone G	4,439
	*Anthraflavone GC Paste Fine—(B)	
	Anthra Yellow GC Paste—(B)	
760	Indan. Golden Orange G (sgle. stngth.)	15,788
	Indan. Golden Orange G Pst.—(B)	
	*Indan. Gldn. Orange G Dbl. Pst.—(B)	
	Helindone Gldn. Orange IG Pst.—(M)	
	Vat Golden Orange G Dbl. Pst.—(B)	
	*Duranthrene Golden Orange V—(BD)	
761	Indan. Golden Orange R (sgle. stngth.)	11,478
	Indan, Golden Orange RRT Pst.—(B)	
	*Indan. Gldn. Orange RRTS Pdr.—(B)	
	*Helindone Gldn. Orange IRRT Pst.—(M)	
	Vat Orange RRT Paste—(B)	
	Vat Orange 3R Paste—(B)	
765	Indan. Green B (sgle. stngth.)	4,904
	†Indan. Black BB Dbl. Pst.—(B)	
	Vat Black RB Dbbl. Paste—(B)	
767	Indan. Violet RR (sgle. stngth.)	6,136
	Indan. Brilliant Violet RR Pst.—(B)	
	†Indan. Violet RR Extra Pst.—(B)	
	Helindone Violet IRR Ex. Pdr.—(M)	
	Vat Brilliant Violet RRP Pdr.—(B)	
774	Alizarine Black	1,500
	Alizarine Black S Pst.—(B)	
	Alizarine Black WR Pdr.—(B)	
778	Alizarine, Synthetic	5,483
	Alizarine VI Extra Pure Pst.—(B)	
780	Alizarine Red	2,776
	Alizarine Red S Pdr.—(B)	
	Alizarine Red W Pdr.—(M)	
	Alizarine Red W Pdr.—(By)	
	Alizarine Red W Pdr.—(Q)	
784	Alizarine SX, GD	2,083
	Alizarine SX—(B)	
792	Cibanone Orange R (sgle. stngth.)	3,520
	*Cibanone Orange R Pdr.—(I)	
794	Cibanone Black (sgle. stngth.)	220
	Cibanone Black B Pst.—(I)	
795	Cibanone Yellow R (sgle. stngth.)	1,760
	Cibanone Yellow R Pdr.—(I)	
804	Alizarine Blue S	1,000
	Alizarine Blue SB Pdr.—(M)	
807	Alizarine Black S	350
	Alizarine Black S Pst.—(M)	
817	Algol Yellow R (sgle. stngth.)	984
	Algol Yellow R Pdr.—By)	
819	Algol Red R, FF (sgle. stngth.)	399
	*Vat Red R Extra Pst.—(By)	
821	Algol Brilliant Violet 2B (sgle. stngth.)	1,608
	Vat Brilliant Violet BBK Pdr.—(By)	
822	Algol Brilliant Orange FR (sgle. stngth.)	1,456
	*Algol Brilliant Orange FR Pdr.—(B)	
	*Indan. Orange RRK Pdr.—(Q)	
827	Indan. Claret B Extra (sgle. stngth.)	832
	*Indan. Bordeaux B Extra Pdr.—(B)	
831	Indan. Red BN (sgle. stngth.)	192
	Indan. Red BN Pdr.—(B)	
	*Indan. Red RK Pst.—(B)	
833	Algol Olive R (sgle. stngth.)	10
	Vat Olive R Paste—(By)	
834	Algol Gray (sgle. stngth.)	872
	Vat Gray K Pdr.—(By)	
838	Indan. Blue RS (sgle. stngth.)	2,533
	Indan. Blue RS Pst.—(B)	
	Indan. Blue R† Dbl. Pst.—(B)	
841	Indan. Blue GGS (sgle. stngth.)	1,100
	*Indan. Blue 2GS Dbl. Pst.—(B)	
842	Indan. Blue GCD (sgle. stngth.)	10,920
	Indan. Blue GCD Dbl. Pst.—(B)	
	Vat Blue GCD Dbl. Pst.—(B)	
844	Algol Blue 3G (sgle. stngth.)	1,436
	Algol Blue 3G Pst.—(By)	
	Algol Blue 3G Pdr.—(By)	
	Vat Blue 5G Pdr.—(By)	
849	Indan. Yellow (sgle. stngth.)	21,014
	†Indan. Yellow G Dbl. Pst.—(B)	
	Vat Yellow G Dbl. Pst.—(B)	
	Vat Yellow G Dbl. Pst. Fine—(B)	
850	Indan. Blue WB	672
	*Indan. Blue WB Pdr.—(B)	
852	Alizarine Irisol DR	497
	*Alizarine Irisol R—(By)	
	*Alizarine Blue JR Pdr.—(By)	
855	Alizarine Pure Blue	1,708
	*Alizarine Sky Blue B Pdr.—(By)	
856	Alizarine Astrol	1,657
	*Alizarine Astrol B Pdr.—(By)	
	*Alizarine Blue AS Pdr.—(By)	
860	Cyananthrol G	110
	*Cyananthrol BGAOO—(B)	

Schultz No.	Name of Dye and Manufacturer	Quantity (pounds)
862	Alizarine Blue Black	5,603
	†Alizarine Blue Black B Pdr.—(By)	
	†Alizarine Blue Black 3B Pdr.—(By)	
	†Alizarine Blue Black 3B (80%)—(By)	
864	Anthraquinone Green GX	121
	*Anthraquinone Green GXNO—(B)	
865	Alizarine Direct Green G	1,102
	Aliz. Cyanine Green G Ex. Pdr.—(By)	
869	Algol Brown R (sgle. stngth.)	5,813
	*Algol Brown R Pst.—(By)	
	Vat Brown R Pdr.—(By)	
880	Indigo Pure	40
	Indigo Paste RB—(B)	
885	Brilliant Indigo BD	3,600
	Brilliant Indigo B Paste—(B)	
886	Brilliant Indigo G	165
	Brilliant Indigo G Paste—(B)	
887	Brilliant Indigo 4G Paste	1,128
	Brilliant Indigo 4G Paste—(B)	
	Brilliant Indigo 4G Powder—(B)	
907	Ciba Scarlet (sgle. stngth.)	4,560
	Ciba Scarlet G Extra Powder—(I)	
	Helindone Fast Scarlet C Paste—(M)	
	Thioindigo Scarlet 2G Paste—(K)	
	*Thioindigo Scarlet 2G Powder—(K)	
908	Ciba Red R	661
	Ciba Red R Paste—(I)	
910	Helindone Pink	110
	Ciba Pink B Paste—(I)	
913	Helindone Orange R (sgle. stngth.)	6,725
	*Helindone Orange R Pdr.—(M)	
	*Tioindigo Orange R Pdr.—(K)	
	*Thioindigo Orange RY Pst.—(K)	
920	Helindone Violet	278
	Helindone Violet IBN Ex. Pst.—(M)	
922	Aniline Black	500
	Diphenyl Black Base I—(M)	
923	Ursol	100
	Fur gray G—(A)	
	*Fur Yellow Brown 4GL—(A)	

UNIDENTIFIED DYES

Acid Dyes

Name of Dye and Manufacturer	Quantity (pounds)
*Acid Pure Blue R Supra—(G)	441
Alizarine Rubinol	8,181
Alizarine Rubinol 3G Pdr.—(By)	
*Alizarine Rubinol GW Pdr.—(By)	
*Alizarine Rubinol R Pdr.—(By)	
*Fast Sulfon Green 2G Conc.—(S)	110
*Polar Red 3B Conc.—(G)	110
*Wool Violet RC—(G)	55
*Xylene Fast Blue AE Conc.—(S)	110

Vat Dyes

Name of Dye and Manufacturer	Quantity (pounds)
*Algol Brown C (sgle. stngth.)	4,561
*Algol Brown G Powder—(By)	
Vat Brown G Paste—(By)	
Vat Brown G Powder—(By)	
Hydron Pink FF Paste—(C)	2,220
Hydron Scarlet 2B Paste—(C)	316
Indanthrene Pink B (sgle. stngth.)	214
Indanthrene Pink B Dbl. Paste—(B)	
Indanthrene Violet BN Paste Fine—(B)	969

Mordant and Acid Chrome Dyes

Acid Alizarine Gray G—(M)	55
*Alizarine Fast Gray 2BL Powder—(By)	716
Alizarine Red DIB New Paste—(M)	500
*Brilliant Chrome Blue 2B—(DH)	110
*Chrome Azurine GP—(DH)	286
*Chrome Fast Cyanine GN—(I)	110
Chrome Printing Azurine G Powder—(I)	5
Chrome Printing Bordeaux B Powder—(I)	5
Chrome Printing Brown 5G Powder—(I)	5
Chrome Printing Green B Powder—(I)	5
Chrome Printing Orange G 2R Powder—(I)	10
Chrome Printing Red B Powder—(I)	5
*Chrome Printing Red Y—(DH)	110
*Chromorhodine BN Powder—(DH)	220
*Chromoxane Brilliant Blue G—(By)	314
†Eriochrome Flavine A Conc.—(G)	1,103
†Eriochrome Green L—(G)	551
Metachrome Olive Brown G Powder—(A)	1,000
*Modern Royal Blue—(DH)	220
*Naphthochrome Blue BN—(I)	110
*Naphthochrome Cyanine R—(I)	110
*Naphthochrome Green G—(I)	110
Printing Violet BD Paste—(I)	132

Direct Dyes

†Benzo Dark Brown Extra—(By)	551
Benzo Fast Eosine BL—(By)	10
Benzo Fast Gray BL—(By)	859
Benzo Fast Orange 2RL—(By)	11
Benzo Red 12B—(By)	1,100
Chlorantine Fast Gray B—(I)	220
Diamine Fast Orange ER—(C)	11
Diamine Fast Violet FPRN—(C)	11
*Diazamine Blue BR Conc.—(S)	5,000
†Diazamine Blue 2R Conc.—(S)	555
Diazanil Pink B—(M)	250
Diazo Brilliant Blue 2BL—(By)	10
Diazo Brilliant Green	61
*Diazo Brilliant Green BL—(By)	
*Diazo Brilliant Green 3G—(By)	
Diazo Brown	141
*Diazo Brown G—(By)	
*Diazo Brown 3RB—(By)	

Name of Dye and Manufacturer	Quantity (pounds)
Diazo Fast Green BL—(By)	25
*Diazo Fast Violet B1—(By)	551
Diazo Fast Violet 3RL—(By)	24
*Diazo Fast Yellow 2G—(By)	121
Diazo Light Green 2RL—(By)	11
*Diazo Rubine B—(By)	220

Sulphur Dyes

*Cross Dye Green B—(BD)	2,240
*Eclipse Brown BK—(G)	10,000
Sulphide Violet V—(M)	200
*Thionol Brown R—(BD)	2,240

Basic Dyes

*Brilliant Acridine Orange A—(DH)	331
Brilliant Rhoduline Red B—(By)	24

Spirit Soluble or Color Lake Dyes

Name of Dye and Manufacturer	Quantity (pounds)
Helio Bordeaux BL Paste—(By)	2,204
Japan Black MBG—(B)	100
Tero (Typophor) Brown PR—(B)	2
Tero (Typophor) Carmine FB—(B)	2

Unidentified, Unclassified Dyes

Composition Color (89 MPS)—(H)	220
Composition Rose Color (87 MPS)—(H)	44
Composition Ocre Rose Color (91 MPS)—(H)	110
Fast Green G—(C)	100
*Genuine Red 8%—(Q)	110
Pinatype Complement Red D—(M)	11
Printing Red—(Q)	110
*Soap Green—(Q)	110
*Sumazine Blue—(Q)	500
Japan Blue R—(B)	5
Japan Violet R—(B)	5

"REFERENDUM" TO BE HELD THROUGHOUT THE COUNTRY

The competition for the American Peace Award, created by Edward W. Bok, and offering $100,000 for the "best practicable plan by which the United States may co-operate with other nations to achieve and preserve the peace of the world." closed on November 15th at midnight; 22,165 plans were received.

The Jury of Award, consisting of Elihu Root, chairman; General James Guthrie Harbord, Colonel Edward H. House, Ellen F. Pendleton, Roscoe Pound, William Allen White, and Brand Whitlock, has been at work on the plans since the middle of October, and is expected to have made its choice by January first. The Policy Committee announces that during January it will present the winning plan for consideration and vote.

This "referendum" will be conducted:

1. Through the daily and weekly press.
2. Through the Co-operating Council of the American Peace Award.
3. Through Mayors' committees in many communities.
4. Through the universities and libraries of the country.
5. Through local organizations of all kinds.

Organizations whose combined memberships total many millions have already agreed to submit a copy of the winning plan and a ballot to their members.

The press of the country covering both the dailies and weeklies is generally co-operating with this attempt to secure from the American people a wide expression of opinion on this vastly important subject. Many papers, which have a consistent policy of not carrying ballots of any kind have made the first exception in their history in this instance.

With so many agencies of such a wide variety co-operating, the committee feels that the "referendum" should be most effective. However, it emphasizes the need of security, not a great volume of ballots representing the hasty, unconsidered action of the voters, but the real opinion of the voters after they have carefully read the plan, or a luminous digest of it.

This paper is co-operating with the Committee of the Award in this matter, and we will carry a copy of the winning plan, and a ballot upon which our readers may state whether or not they approve the winning plan in *substance*.

PEERLESS AND NOIL COMBINE SALES EFFORT

As of December 1st, the Peerless Color Company and the Noil Chemical & Color Company have united their sales departments under the direction of Arthur L. Benkert, who has for several years past been Secretary and Sales Manager of the Peerless Company.

By this arrangement a very considerable economy in sales effort will be effected. Both companies manufacture, primarily, a line of direct colors which happen not to compete in any instance. Neither company has made it a practice to compete for business on a price basis, but has sold its products on a quality standard. By the combination thus effected a line of direct colors comparable with that offered by any single manufacturer in America will be available through one sales avenue.

Manufacturing arrangements are in nowise affected by this sales combination, neither are existing sales agencies already established by either concern, such as representation of both in New England by the Dunker & Perkins Company, or of the Peerless Company in Philadelphia by L. B. Fortner Company.

This is a step along the line of co-operation and economy of effort which The Reporter has repeatedly recommended in its editorial columns. If similarly common-sense arrangements could be made by the manufacturing departments of our dyestuff-producing concerns the industry and its customers would benefit materially.

Fast Dyeing of Wool Fabrics

Manufacturer's Point of View—The First Mordants—One Advantage of Natural Dyes—Logwood Survives —The Alizarines—Fluoride of Chrome—After-Chrome Process

By BERNARD FIRTH*

THE term "fast" is still very vague and very elastic, and until we reach the stage of absolute permanency it can only be used accurately in a comparative sense. One degree may be considered fast for a certain quality of material, whereas for a higher-grade quality the standard of fastness requires to be increased, although in the two cases the color may be recognized as fast. The wearer's idea of fast is that the color will not change during the life the the garment; that is to say, that it will stand the action of light and ordinary wear and tear.

As dyestuff manufacturers, we ourselves have sometimes great difficulty in compiling fastness tables to satisfy everybody's view on the subject. Take, for instance, a comparison between Diamond Black F and Alizarine Blue Black B to light. The former as a black is very good but as a gray it is only moderate, whereas Alizarine Blue Black, which is generally used in light shades, is very good in low percentages. It would, however, not be correct to say that Diamond Black F, which is only used as a black, does not possess very good fastness.

Manufacturer's Point of View

For the manufacturer there is another side to the question: the color must first of all be able to withstand the various wet finishing processes to which the wool is subjected after dyeing. This, of course, does not concern the piece dyer so much as the wool and yarn dyers, who are generally up against the question of fastness to scouring and milling, which is a drastic treatment for any dyestuff. No matter how fast a color is to light, it is useless if it does not stand the milling process; for example, any bleeding of the dyestuff would tend to destroy the effect of the design, and any alteration of shade would seriously affect the harmony of the blend.

Excluding the vat colors, which, except Indigo, are so far not a commercial proposition in wool dyeing, the chrome colors are the fastest all-round dyes for wool on the market, and as a whole produce shades which meet with most requirements of the fast dye trade. By chrome color is meant organic compounds which are capable of combining with chrome and becoming fixed to the fiber as chrominum color lakes. Chrome colors comprise such groups as anthaquinone derivatives (i. e., alizarine), oxazines, thiazines and azo compounds, which represent products of varied constitution. The fastness properties of any one chemical group are not necessarily alike, and in the same way the different groups vary in this respect. That is to say, the name or fastness of a dyestuff has necessarily no relation to its constitution. Azo colors are even sold under the name of alizarine. The present range is, however, sufficiently large and representative that the dyer has not much difficulty in selecting a color suitable for any particular job. It is nowadays possible for the manufacturer to adapt himself to circumstances and alter the stage at which the dyeing takes place.

On account of the wet finishing process which dates back to the early days of cloth manufacture, the woolen industry has always needed fast dyes, and even since the early period of dyeing a certain number of natural products of plant life have fortunately been available, which were at any rate sufficiently fast for the immediate requirements. In most cases, however, they left something to be desired in respect to fastness to light.

Although those which acquired economic importance were comparatively few in number, they were sufficiently varied in color to permit of the production of a good range of shades by combining one with another or used on the top of the vatted indigo. They may be said to represent the survival of the fittest, since no better natural dyestuffs are known, and the following names will be familiar to the old wool dyer: Logwood, sanders wood, barwood, camwood, Brazil wood, weld, cochineal, turmeric, orchil, cudbear, fustic, quercitron, bark, indigo, woad and annatto.

With the exception of indigo and woad, which possess direct affinity for the wool fiber from a reduced vat, also cudbear, orchil, annatto, and turmeric, the natural dyestuffs have little affinity for the wool fiber and require a mordant. It was not until the art of mordanting became known at a very early date in Hindustan and the Far East that any considerable advance in real dyeing became possible.

The First Mordants

The mordants first employed consisted evidently of the natural occurring sulphates of aluminium and iron, the former being the most valuable for the purpose. There does not seem to exist any record as to the lines on which the application of natural colors progressed, but the introduction of the use of bichrome as the principal wool mordant in the early part of the last century was certainly an epoch-making discovery. The original mordants of alum and iron had their drawbacks, the

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chief being the tendency to impart a harsh feel to the wool, in addition to the difficulty and uncertainty of application. A chrome mordant could not at once be generally used, owing to the resulting shade becoming entirely changed, as, for example, Persian berries, which give a bright yellow on aluminium and only a brown on chrome. Cochineal gives a bright scarlet on tin and only a purple on chrome. In the majority of cases, bichromate yielded shades faster to light.

Whereas the major portion of these natural coloring matters, owing to the advance of the artificial dyestuffs, are now of limited importance, considerable quantities of logwood—chiefly now in the form of extract or crystals, also some fustic, used for shading the black—still find application, and though the use in dyeing for the others is trivial in the extreme, it cannot be said that they have entirely disappeared from the market.

One Advantage of Natural Dyes

Owing to the easy solubility of the natural dyes, permitting of their easy absorption by the fiber during the dyeing process, and to the fact that the majority yield with mordants colors of a more or less permanent character, as a class they suffered but little in general estimation during the twenty years which succeeded the discovery of the first aniline dye in 1856. Madder, up to that time the most important of all coloring matters, but of chief interest to the cotton dyer, was, however, the subject of much research, and as a result of the synthesis of its main constituent—alizarine—in 1870 by Graebe and Libermann, madder had a serious rival.

Owing to its inability to compete with the synthetic product in price, purity or concentration, and uniform quality of coloring substance, madder has almost completely disappeared from commerce, and consequently the hundreds of thousands of acres which were used for its cultivation have been made available for the growing of crops. Madder was not used to a great extent in wool dyeing, the chief use being for the French red military trousers for which the use of alizarine was forbidden. This, I understand, was ordered with a view to encourage the production of madder. The indigo dyer used it in the woad vat, but in this case madder fulfills the purpose of a ferment rather than a dye.

Indigo, the most important survivor of the vegetable group, is now also produced artificially, and was introduced into the market in 1897 after many years of labor and money had been spent on the work. Baeyer's name will always remain inseparably connected with the synthesis of indigo from ortho-nitrobenzaldehyde, which gave a process with some possibility of commercial application. Owing to the difficulties encountered, however, the numerous attempts to apply the result of Baeyer's researches in commerce failed, but with the synthesis of Heumann in 1890, using phenyl glycine and its carboxylic acid, a new method was available to investigators, which finally solved the problem of the manufacture of indigo—certainly one of the most startling of chemical synthesis. Synthetic indigo now possesses the same chemical and dyeing properties as indigotine from the indigo plant, and besides has the advantage of always being supplied in a regular and constant form, containing no foreign matter.

Logwood Survives

Logwood, therefore, is the only real survivor of the natural coloring matters as far as wool is concerned. This can be accounted for by its cheapness, fullness and brilliancy of shade, which have never been surpassed by coal-tar dyes, and only in a very few cases equalled. It also has the peculiar property of feeding and weighting the wool, which is more or less characteristic of the wood colors.

What has been happening in the meantime? How have the needs of the dyers of fast shades been catered to? The birth of the aniline industry, or the brilliant discoveries that followed in the domain of coal-tar color chemistry, did not put forward a single product for obtaining fast shades on wool. It was not until the discovery of alizarine that science could compete with the product of nature in the direction of fast colors for wool dyeing. Derivatives of alizarine soon followed on in rapid succession, so that we have now practically a complete range belonging to this anthraquinone group, the most important being Anthracene Brown, Alizarine Blue, Cyanine, Anthracene Blue, Alizarine Cyanine Green, Alizarine Green, Alizarine Viridine, and Alizarine Blue Black. Alizarine Black S and WX, although belonging to the quinone series, are not true anthraquinone colors.

The Alizarines

The alizarine dyes and the dyes of vegetable origin are closely related in tinctorial character, and only in exceptional cases can they be fixed on the fiber without the use of a mordant. On account of its cheapness, easy application and capability of yielding faster shades, the process of mordanting by means of chromic acid in the form of bichromate of soda or potash has become the most important and most generally used. But whereas the bichromates, by reason of their oxidizing properties, possess certain advantages for the dyeing of natural colors, they proved less suitable for the alizarines and yielded shades loose to rubbing. The conclusion was come to that a large portion of the dyestuff was destroyed by oxidation in acting as a reducing agent to render possible the combination of the remaining portion of dyestuff with the mordant.

To overcome this, the chromic acid was reduced during the mordanting process by the addition of suitable reducing agents such as tartar, oxalic or lactic, and lately, formic, acids. Thus we have what is known as reduced and unreduced chrome mordants. I do not intend to go into the chemistry of the reaction between chrome and wool during mordanting. Numerous theories have

been advanced to explain the process, but no definite explanation has been arrived at; it has, however, been established that the metal is absorbed by the wool in the form of hydrate, and the chromic acid formed must actually be reduced to chromic oxide prior to the formation of the chrome lake with the dyestuff. In order to assist in fixing a greater amount of chromium on the fiber than when bichromate is used alone, an addition of acid or acid salts can be made to the dye bath, sulphuric acid being the most common addition.

The chief advantages of dyeing by the chrome mordant or two-bath method is the easy control of the final shade. A further advantage is that greasy wool can frequently be well dyed. Against these, the disadvantages are the length of the process, the difficulty in penetration, and unsatisfactory fastness to rubbing.

Apart from chromium fluoride, chrome alum is the only salt of chromic acid that has been employed in wool mordanting. The amount of chromium fixed from this product is about twice as great as that fixed by equivalent percentages of bichromate under the same conditions. Probably part of the chromium sulphate is simply absorbed by the fiber and is not fixed in a permanent manner, since it yields greatly inferior shades to bichromate.

Fluoride of Chrome

Chromium fluoride has frequently been recommended in wool dyeing, but its use does not seem to have become very widespread, possibly owing to its unsuitability in presence of copper, and to the wool receiving a harsh feel through the liberation of hydrofluoric acid. Chromium fluoride seems particularly useful where bichromate is injurious on account of its oxidizing action.

A second method of applying chrome colors consists of the simultaneous dyeing and mordanting. This is, of course, not an idea of recent date, as the method was formerly made use of in the case of cochineal and stannous chloride, logwood and copperas, madder and bichrome. The method can only be applied to such dyestuffs and mordants as form color lakes soluble in acid solution. With the exception of Alizarine Blue, which exhausts very well, none of the alizarine colors give satisfactory results, only yielding light shades. Some of the azo chrome colors were tried, such as Diamond Black, which was not a great success when dyed on a chrome mordant owing to the unlevelness of its dyeings. The method recommended was to boil the wool for one hour in a solution of the dyestuff and then to add gradually a solution of bichromate. The result was unsatisfactory, owing to the premature formation of the color lake in the bath.

A valuable technical improvement of this method was affected by the introduction of ammonium salts as auxiliary agents, which is the basis of the meta-chrome process. This consists of a mordanting liquor containing a chromate and ammonium sulphate, which is neutral; on boiling it gradually becomes acid, as part of the ammonia is driven off. When dyestuffs are added to this mordanting liquor, the color is absorbed by the fiber, and only at the boil is the chromic acid very gradually liberated; it is immediately taken up by the wool and reacts with the color already fixed upon the fiber.

This property proved to be characteristic of certain dyestuffs to give practical results in this manner, and led to the appearance of several well-known meta-chrome colors, which were recommended for use with the ready prepared meta-chrome mordant of chromate of soda and ammonium sulphate.

A similar effect can be produced in a shorter time with particular azo colors by the use of bichromate together with the dyestuff, by starting neutral and gradually adding acid. This may be modified by commencing with a small amount of ammonium acetate, which on boiling splits up into acetic acid and ammonia..

The Chromazol method has more recently been recommended, although it is really no new idea. It consists of the use of an oxalate of chrome, which forms a color lake in the same manner as fluoride of chrome, but does not possess the drawback of the latter. It only seems applicable to a small number of colors such as Brilliant Alizarine Blue R and Gallocyanine, which are sensitive to oxidizing agents and cannot be applied by the usual meta-chrome or chromate processes.

The use of chrome along with the color in the dye bath is really only a modified form of after-chrome process, the chromic acid becoming active by the action of the acid and reacting on the dyestuff after it is on the wool fiber.

The process, however, has one distinct advantage in that the development of the shades is taking place all the time the bath is on the boil, thus simplifying the work of matching. The chief disadvantage is the restricted number of dyestuffs available for the purpose.

After-Chrome Process

The after-chrome process proper came into existence in about 1890, shortly after the introduction of Diamond Black F on the market. The method suggested now for the use of this new color was to boil the wool in the dye solution and treat the dyed fiber in a separate mordant liquor. Very good results were obtained in this manner, but the more convenient way in vogue at the present time of chroming-off in the exhausted dye-liquor is considered sufficiently satisfactory for all practical purposes. Chromium fluoride has been used in place of bichromate with a few dyestuffs which do not resist the oxidizing action of chromic acid. It has, however, not found much favor, since the majority of dyestuffs are not well fixed.

The obvious drawback to the after-chrome or top-chrome method is the impossibility of gauging the resulting shades. In dyeing blues and blacks a dyer learns by experience what percentage of color will produce the desired shade, and consequently does not require to match off. On the other hand, the process claims many advantages which lie in the direction of more level dyeings,

better penetration, making dyeing in the machine, by the pack system, possible, which is not the case by dyeing on the chrome mordant. At the same time all the azo chrome colors are suitable for this process. It is essential that the material be well scoured and rinsed off, otherwise poor dyeings result.

Of late years an interesting development in the dyeing of acid mordant colors has been the reintroduction of copper to some extent. A color like Era Chrome Dark Blue B, which gives a greenish shade of navy blue when dyed in combination with chrome, produces a much bloomier and redder tone if copper sulphate is used. For this purpose, the best results are obtained by the top mordant method, and the shade produced is of quite good fastness. The question of shading is made difficult owing to the presence of copper, which affects any ordinary acid colors adversely.

The fact that no one method of applying chrome colors has been generally adopted or has succeeded in completely replacing the others shows that all the processes have their advantages. Not one of them, however, has attained the state of perfection.

The claim that the chroming methods do not impair the strength of the wool fiber more than the old process of topping indigo in a neutral bath with natural colors has been completely investigated. These tests emphasize the destructive effect of bichrome, especially in cases where it is added to an acid bath causing chromic acid, the powerful oxidizing agent, to be liberated.

To sum up, therefore, it appears as though the fast shades in wool dyeing are at present obtained at the expense of the fiber, and a complete range of acid dyeing colors would consequently be welcomed by all concerned. There are certainly a number of dyestuffs on the market whose fastness properties are sufficient for many purposes, but they cannot be classed with the fast dyes of the chrome series.

The only alternative open at the present time would be the use of vat colors which, by treatment in a moderately warm and weak alkaline dye bath, would have no deleterious effect on the wool fiber. Such dyes are now obtainable, but at present prices the cost of dyeing is prohibitive, and the dyer has no choice but to remain faithful to the chrome dyes for his fast shades.

The Wilmington Bleachery Company, Wilmington, Del., bleachers and finishers of towels and cotton piece goods, have purchased a tract of land at Rhawn Street and State Road, along the Pennsylvania Railroad, at Holmesburg, Philadelphia, for a new plant. The buildings will cover 38,000 square feet of floor space. It is understood that the company will remove its entire business to the new location, where some 200 workers will be required. The officers are Joseph N. Harman, president; Joseph N. Harman, Jr., vice-president and secretary, and H. E. Harman, treasurer.

Review of Recent Literature

The 1924 Spring Season Shade Card of Dyer's Formulas has been issued by the National Aniline & Chemical Company. It is a thirty-two page booklet listing the recipes for silk, cotton, wool and leather colors. Under the section, "Dyeings on Skein Silk," alone there are listed formulas for fifty-six different shades and colors. The two sections devoted to cotton and wool are as usual sub-divided into Direct and Basic Dyes. All recipes were prepared by the Dye Application laboratories of the Company for matching the shades shown in the 1924 Spring Season Card issued by the Textile Color Card Association.

Copies of this book, which is now ready for distribution, may be obtained upon request to the National Aniline & Chemical Company.

A new brochure of seventy pages, neatly printed and bound, has been issued by Bosson & Lane. In addition to describing their dyeing, finishing and bleaching products, the book contains interesting and valuable descriptions of textile processes and many useful notes, making it a miniature reference book for textile men.

There are sections dealing with Turkey red oil, bleaching oil, chlorine, bluing and sizing liquids. Then, in the section devoted to each product, is a description of its use, or of the process in which it is featured. Such subjects as "Bleaching Cotton and Turkey Red Oil," by G. G. Hertel; "Process for Dyeing 100 Pounds of Turkey Red Yarn," "Modern Methods of Bleaching," "Sizing Cotton Warps" and "Boiling Off Silk" make the booklet one that will doubtless be consulted often; one that, by its very appearance, should assure the dyer and textile chemist of the worth of its contents.

Copies of this book will be mailed free to any person, provided the request is written on his company's letterhead.

A new 52-page catalog issued by the Kalbfleisch Corporation was conceived primarily as a reference book of useful information to all those who use acids and chemicals. In this booklet will be found a brief outline of the history and policy of the Corporation, a list of their products, tables on acids for ready reference, and other data that the user of chemicals likes to have at his finger-tips.

The section devoted to the products endeavors to give information about the materials themselves, their use and

application in the various industries, with something about the types of containers in which they are shipped.

There is also contained in the book a short description of the Simplex Acid Pump which is now being used by a number of firms for unloading acids, etc., from carboys. This very simple device has been found useful to all those who use less than a carboy of material at a time.

The tables in the back of the booklet give the Baume, specific gravity and chemical content of sulphuric, nitric and muriatic acids and aqua ammonia.

The booklet is illustrated with photographs of the five plants of the Kalbfleisch Corporation. Copies may be had upon request direct to the Company.

The Textile Color Card Association have just issued a lengthy bulletin describing their newly completed "Spring 1924 Color Card." From this report it is evident that the color selection was strongly influenced by Oriental style, embracing "authentic Chinese and Japanese colorings in all their rich brilliance."

Among the colors are: Narcissus (yellow), Apple Green, Cleopatra (blue), Chinese Red, Yu Chi (bright blue green), Pansy, Cosmos (orchid), Daphne (blue), Sunflower (orange), Fleur-de-lys, Louis Philippe (azure). In addition there are several blues, three greens of Russian origin—Riga, Kara and Maris—three other grayish greens and several grays. The Card also shows many shades of tans and browns.

The woolen colors include tans, a rosewood, a gray green, grays, red orange and yellow and a porcelain blue. Elsewhere in this issue are listed the spring shoe colors. Among the more prominent hosiery colors shown on the card are Airedale, and Racquet (tans), Tanbark, Bombay (golden brown), Piccadilly (reddish brown), Oriental Pearl, Jack Rabbit, a new color, and Log Cabin, Mandalay and Otter, retained from previous seasons.

In a folder accompanying the Color Card the origins of the new colors are explained and briefly described. A supplementary folder includes two more colors, a yellow, Jasamine, and a light beige shade, Flax, both cotton colors standardized by the Association at the instance of both the National Association of Finishers of Cotton Fabrics and the Converters' Association.

FOSTER OPENS NEW OFFICE

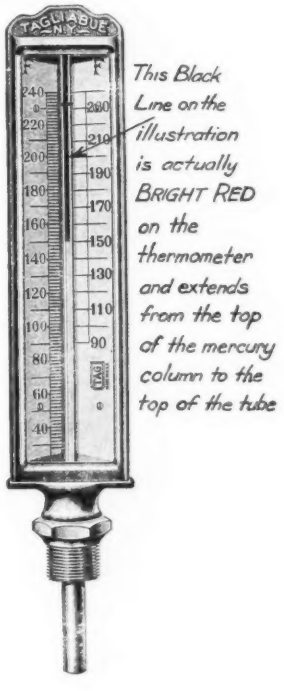
Edward C. Foster, dyestuff dealer of Providence, has opened a new office at 274 Washington Street, that city, which is one of the most commodious and attractive of its kind which it has been the pleasure of The Reporter's representative to visit.

Occupying the entire second story of a new brick building, the office is reached through a private stairway to the street. The front rooms are given over to general offices on one side and salesmen's quarters on the other. The rear has private offices for the executives and a large and extremely well-equipped laboratory for customer service work. A particularly good feature of the laboratory is that it has direct skylight overhead which gives excellent facilities for general work and color matching in particular.

EASY READING MERCURY THERMOMETERS

The accompanying illustration supplements our recent item describing a new method of thermometer tube construction known as the TAG-Hespe Red Reading Column. A broad red line shows from the top of the mercury column to the top of the tube. When the mercury rises it covers more of this red line; when the mercury falls a correspondingly greater length of the red line is exposed. The decided contrast between this bright red line and the metallic gray of the mercury brings to the accurate mercury thermometer the easy readability of the red spirit instrument.

TAG-Hespe thermometer glass (tubing) is in every way similar to ordinary lens front thermometer glass



except that in TAG-Hespe Glass the BACK of the fine capillary bore (up and down which the mercury travels) is made of bright red glass. This red streak of glass extends all the way from the top of the thermometer down to the bulb. Note particularly that the red glass is in the back of the bore and NOT at the back of the tube.

The red line attracts the eye at first glance and it is easy to follow it down and take the reading at its bottom which is, of course, the top of the mercury column.

It should be noted that this feature is applied to mercury thermometers and that, therefore, there is no sacrifice of accuracy to attain this remarkable readability.

CHEMICAL EQUIPMENT MEN ADOPT CODE OF ETHICS

The organized manufacturers of chemical equipment and accessories have just defined in a formal document fair and unfair business practices as these affect their dealings with the chemical and chemically controlled industries.

This document is now the Code of Ethics of the Chemical Equipment Association.

Equipment manufacturers have long felt that certain practices have been countenanced by custom which a fair-minded examination of the facts would plainly establish as abuses against the seller. They have also been cognizant of the purchasers' right to have certain habits of trade, and protective practices, given general recognition.

With these two main considerations in mind, the Association entrusted the formulation of a Code of Ethics, a number of months ago, to a committee comprising Edwin C. Alford, T. Shriver & Co., Chairman; W. B. Tardy, Schutte & Koerting Company, and A. B. McKechnie, Parks-Cramer Company. This committee, collaborating with the Secretary of the Association, Robert Everett, undertook a considerable investigation of current business practices, the final result of which is the Code now officially adopted by the organization.

The set of laws laid down embraces principles covering the manufacture and sale of chemical equipment, deeming as unethical and deserving of censure violations such as the distribution of products of inferior or unsatisfactory nature, commercial bribery to obtain new business, long-term credits, misrepresentation of market conditions, commodities or service; trade-mark infringement, boycotting or forming combinations for the prevention of regulated trade; dissemination of false costs sheets or illegitimate discrimination in prices between different purchasers; the unauthorized divulgence of confidential information; refusal to abide by contracts, or refusal to aid the public welfare upon appeal from governmental or other recognized authority.

The Code in addition includes ethics pertaining to business relationship among companies, and maintains that it shall be considered ethical in the eyes of the Association if a member refuses to enter, or to remain in, such relationship with organizations or individuals that have been or are found to divulge confidential information or repeatedly to request quotations, etc., for comparison or inventory purposes only.

The Code ends with this paragraph:

It is within the spirit of the ethics of the Association that this formulation of them shall in every instance be liberally construed as applying to every possible product and service coming within the field of chemical equipment, within the interest of its membership; to every class of business represented among that membership, whether manufacturing, designing, erecting, distributing, consulting or what not; and to every business and professional relationship, as of maker to user, seller to buyer, engineer to client, or competitor to competitor, that normally arises or at any time may arise, involving a member of the Association as a party and the field of chemical equipment as the Association has or may define it, as its base.

LEATHER COLORS FOR SPRING, 1924

The styles committees of the National Shoe Retailers' Association and the National Boot and Shoe Manufacturers' Association, in joint conference with the styles committees of the Tanners' Council of America and the National Shoe Travelers' Association, held at the Hotel Astor, New York City, on Tuesday, November 13, arranged the program for the guidance of retailers, indicating what should be provided for selling during January, February and March and for Easter, 1924, and indicating the proper shoe for the occasion.

High colors in solid effects will be in keeping with individual demand. Shades will lighten as the season progresses. Color tendencies in the order of their importance are as follows: Racquet, Bombay, Airedale, Tanbark, Mandalay and Loch Rabbit. Suede leathers in combination with grain-finished calf and kid and patent in the order of their importance are: Airedale, Racquet, Tanbark, Bombay, Black, Mandalay, Loch Rabbit and Otter.—Hide and Leather.

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20,000	"	Sulphur Brown
17,000	"	Sulphur Cutch

Make offer. Samples upon application. Address Box 235, American Dyestuff Reporter.

DYER WANTED

Man with both technical and practical experience to take charge of bleaching and dyeing of cotton in skeins, hard twist, both machine and tub dyeing, at plant in Montreal, Canada. State qualifications, experience and salary expected. Address Box 239, American Dyestuff Reporter.

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Dyestuff salesman wanted by old established manufacturer and importer to cover New York City, New Jersey and Connecticut. Only experienced men with established trade need apply. Address Box 240, American Dyestuff Reporter

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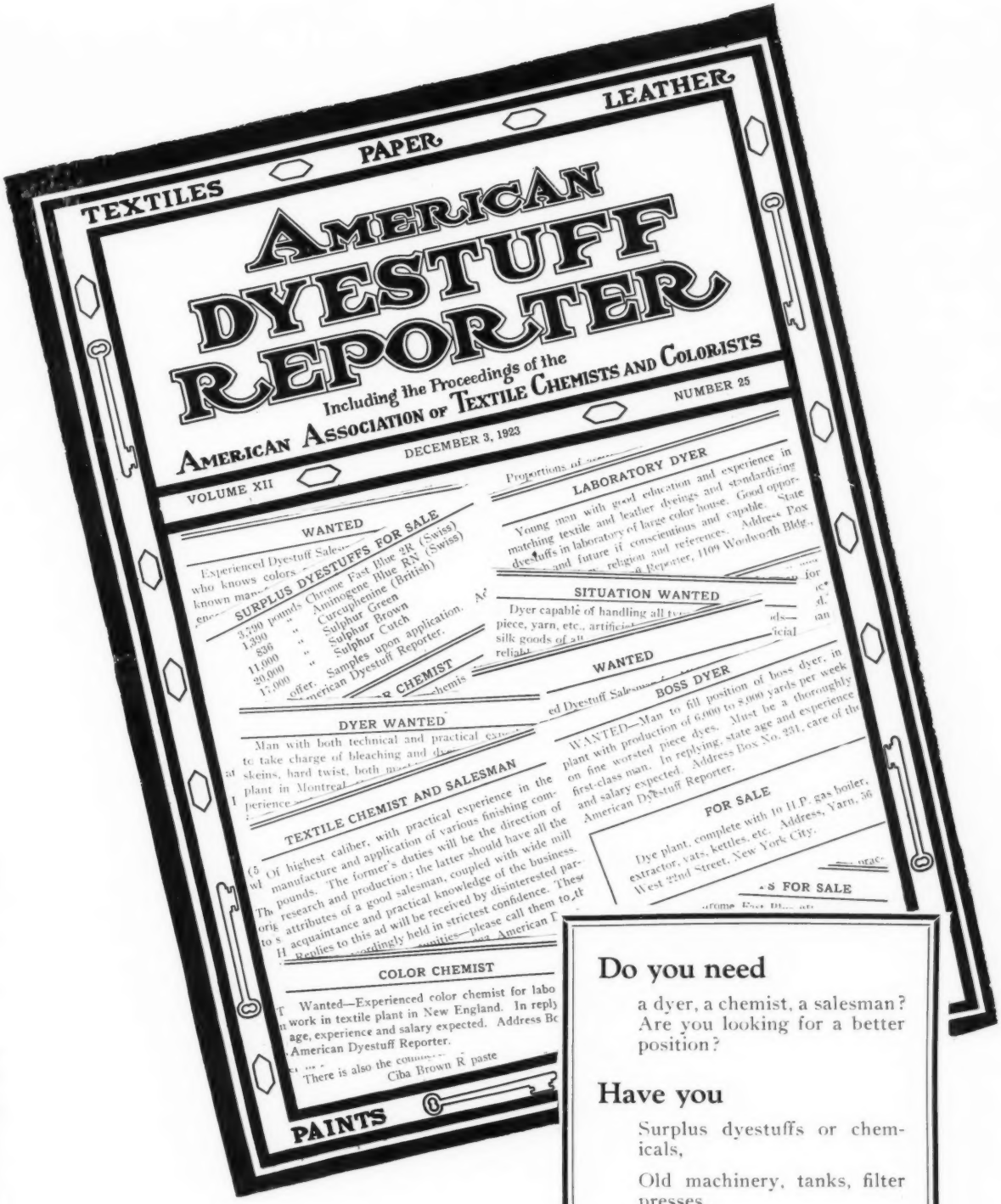

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